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WOUND HEALING—EXPERIMENTAL AND STATISTICAL STUDY

I.—Historical

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THE MECHANISM OF REPAIR

HOW does a wound heal? Let us assume that we are dealing with a knife wound involving all the layers of the abdominal wall, in a young, vigorous, healthy adult. The wound is not infected, and suture and ligature material have had no deleterious effect.

Although the wound was made by a sharp instrument, cells are traumatized. Crushing of the blood vessels by hemostats causes the death of cells deprived of their blood supply as well as that of traumatized cells. The injury releases potassium from the cells (29) which, together with peptones and other protein-split products, produces dilatation of the blood vessels. Relative anoxia, an increased percentage of carbonic acid, and the concentration of metabolic end-products cause an increase in local acidity, which sustains the vasodilatation and results in the exudation of fluid and the migration of leucocytes. The fluid is high in fibrinogen and globulin (3). Fibrin is formed, which seals the wound and provides a bridge for the invading cells. This is the phase of traumatic inflammation.

The second phase is destruction, and in our hypothetical wound this period is probably of short duration. The wound is freed of its debris and dead and dying cellular elements. Autolysis and heterolysis are the principal activators in this process. Trypsin and pepsinlike autolytic enzymes are liberated by the dying cells (11). Heterolysis is a function of the leucocyte. Opie (72) and others have shown that the polymorphonuclear leucocytes produce proteolytic enzymes that are trypsinlike and erepsinlike in action. These enzymes, known as leucoproteases, have been recovered from pus. Their action is inhibited by an antienzyme of the blood serum, and, therefore, in the zone of untraumatized tissue, heterolysis does not occur. According to Opie, leucoproteases are active also within the cells which produce them. Thus polymorphonuclears are capable of engulfing cellular debris and digesting it within their substance. Also important in the phase of destruction are the macrophages and monocytes.

The phases of traumatic inflammation and of destruction together constitute the lag period, during which no gain in wound strength is observed. The lag period is common to all wounds and cell growths. A lag of from five to seven days was first noted by Carrel and Du Nouy (16) while studying skin wounds. Robertson (76) mentions it in connection with the growth of bacteria and infusoria. Howes, Sooy, and Harvey (45) tested the tensile strength of abdominal wounds at daily intervals and concluded that a lag period of from four to six days occurred. Coincidentally with the beginning of fibroplasia, this period terminated and the wounds began to show strength. The line of demarcation between the traumatic inflammatory and destructive phase is not well defined. There is apt to be considerable blending and both phases may be operating concomitantly.

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The third phase is proliferation. The sequence of events during this period varies somewhat in different tissues. The proliferative phase is initiated by a so-called formative stimulus, but exactly what this stimulus is has never been definitely proved. Gaza (24, 25) attributes it to the traumatic inflammation and tissue anoxia incident to the injury. Others have shown that substances liberated by the trauma have a stimulating effect (75). According to Carrel and Ebeling (17), certain substances contained in embryonic tissue juice are capable of greatly enhancing the proliferation of cells in culture. Carrel (13, 14, 15) believes that the active substance is a protein-split product and is probably manufactured by leucocytic ferments from cell debris and fibrin lying in the wound. Leucocytes in vitro (13) produce a growth-promoting substance of embryonic protein or protein-split products. Baker (9) believes that the stimulating substance is glutathione or hemoglobin. Hammett (31, 32) has produced evidence (increase in the number of cells) which indicates that the sulfhydryl group (-SH) is the essential stimulus to growth. More recently, Loofbourow (60) and his coworkers have found that a wound hormone or an intercellular hormone is produced by injury to cells. This hormone, a quinine-adenine-nucleotide complex produced by injury to animal tissue, is capable of stimulating the growth of yeast cells.

The proliferative phase of healing in skin wounds differs somewhat from that of healing muscle, fascia, and peritoneum. In the healing of skin wounds, two processes are of significance, namely, contraction and epidermization (57). In our hypothetical wound, the first of these processes does not prevail, since the skin is in apposition and there has been no loss of substance. Epidermization proceeds primarily by a shifting movement of the epithelial cells, which take their places in the injured area by ameboid movement from the neighboring territory. Mitotic division is not a feature of the early stages, and in superficial wounds it may not occur at all. When mitoses are observed, they are usually present outside of the immediate zone of repair, and their activity probably represents an effort to replace cells that have been displaced by migration. This process is complete in four or five days.

The healing of muscle, fascia, and peritoneum is primarily a process of fibroplasia. The course of events during the proliferative phase is similar in these tissues, except that the lining mesothelial cells probably act the same as in skin healing.

The existing fibroblasts play a minor role during the period of fibroplasia. For the most part, this process is carried on by a group of cells of varied origin—mononuclear, nongranular, ameboid, and phagocytic. Because of their diverse appearance they are grouped under the common term "polyblasts" (68). Polyblasts arise from resting mesenchymal elements present about the blood vessels, or from existing histiocytes or macrophages. According to Maximow (68) the most prolific source of polyblast cells is the lymphocytes and monocytes that have accumulated in the wound in response to traumatic inflammation. All these are capable of becoming fibroblasts (18). The polyblasts become transformed into fibroblasts, and, together with some of the existing fibroblasts, migrate into the wound defect. These connective-tissue cells are guided along the filaments of fibrin. Their movement is further governed by differences in electrical potential of the poles of the cells—which process is called stereotropic response (12, 33, 56). Cells are polarized so long as they are facing a foreign body or a wound cleft, with the difference in electrical potential as the driving and directing force. Concomitantly with the migration of fibroblasts, endothelial buds spring from the capillaries and stretch forward into the fibrin mesh, making a way for themselves by their motility and digestive powers. These capillaries first grow as solid tubes of cells which are canalized by the pressure of the blood within the capillaries from which they arise (62). The newly formed capillaries anastomose and become the highways of nutriment for the fibroblasts. Later on in this process—which covers a period of four or five days—fibroblasts begin to branch, and collagen is deposited.

The formation of collagen is of fundamental importance in wound healing, since it is responsible for the strength of the new tissue (46). The fine fibrillary fibers seen within the substance of the fibroblasts and extending down into their branches are formed as the cells mature, and are not directly related to the formation of collagen. When collagen first appears (about the third or fourth day), it takes the silver stains readily, is immature, affords little strength, and is known as precollagen. At about the tenth or eleventh day, the collagen no longer takes the silver stain, maturation is complete, and the adult collagen affords strength to the wound.

Most authors agree that collagen is extracellular in origin. Baitsell (7, 8), from his studies of tissue cultures, concludes that the fibrin net fuses and consolidates, which results in fine wavy fibrils which unite to form wavy bundles. These freely intertwine and anastomose. The collagen fibers arise outside of the cell, but living cells are neces-

sary for the transformation. The transformation in Baitsell's cultures occurred before the cells moved in, after which the cells migrated between the bundles separating them. The cells at first are round, and then become flattened, and, finally, spindle-shaped because of the pressure of the collagen bands. Wolbach (86) adheres to the theory of extracellular production of collagen, but believes that the collagen is secreted by the cells. Hass and McDonald (37) are of the opinion that some unknown factor is responsible for the intersection of the culture media and fibroblasts to yield collagen in vitro. In tissue culture, collagen appears as round fibroblasts within from six to eight days, and increases in amount until the explants are from fourteen to sixteen days of age, after which time it diminishes. In wounds, collagen appears within from three to five days. It increases in amount and matures until the tenth to the fourteenth day.

The phase of proliferation in wound healing is indicated by gain in strength. Howes and Harvey (42, 43, 44) have shown that this increase in strength parallels fibroplasia, beginning on the fourth day and persisting until the twelfth to the fourteenth day.

At the end of twelve to fourteen days, the wound has reached its maximal strength (45) and for all practical purposes is healed. The scar, however, is rich in fibroblasts and blood vessels. Now occurs the final phase of healing, namely, maturation, during which time the scar becomes paler, less vascular, and cellular. Then follows the period of shrinkage, which occupies several weeks.

Processes Which Influence Healing

General Factors

Age of patient. Du Nuoy (21) was able to express mathematically the relationship between the age of the patient, the area of the wound, and the index of cicatrization. His studies reveal that wounds heal faster in young than in adult animals, and that the rate of healing is inversely proportional to the age of the animal. Howes and Harvey (42) have demonstrated that the lag period is shorter in young rats than in adult rats. Actual fibroplasia is not greater, but the retardation of fibroplasia, or the period of healing during which the increment of tensile strength is decreased is shorter in young than in aged subjects. Clinically, surgeons are familiar with the delayed period of healing in aged patients.

Temperature. Ebeling (22) studied the effect of temperature on the rate of healing in wounds of alligators and concluded that for each 10°C rise in temperature, the rate of healing increased about twofold. Since the rate of a chemical reaction is similarly increased, Ebeling suggests that the increased rate of healing is consequent to the acceleration of the chemical reactions in the wound. Leriche and Haour (54) have reported the observation that wounds in sympathectomized areas heal faster than do control wounds. The stimulated healing is in part due to increased local temperature. Arieff has shown that cold delays wound healing.

Water balance. Delayed healing in dehydrated animals is consequent to impairment of the circulation and to nutritional changes in the region of the wound. Anhydremia results in decreased blood volume, peripheral vasoconstriction, increased viscosity, stagnation, and decreased volume flow through the tissues. These factors bring about anoxia and starvation of the wound. Habler (28) has shown that suboxidation results in a decreased rate of tissue metabolism and alters the form, speed, and direction of the chemical reactions responsible for healing. In an experiment lasting fourteen days, Bird and MacKay (10) tested the tensile strength of wounds of dehydrated rats and found it to be less than that of the wounds in the control animals which were not dehydrated.

Hyperhydration causes tissue edema, interferes with venous return, and has much the same effect as dehydration. Whipple (84) and Mason (67) have stressed the importance of proper fluid balance in the healing of wounds.

Acidosis and alkalosis. Normally the healing wound is acid in reaction. Vasodilatation essential to wound healing occurs and is maintained at a pH between 5 and 7. Above and below this level vasoconstriction occurs (5, 6). The vasodilatation and moderate acidity are probably responsible for the exudation of cells and plasma colloids from the capillaries (3). The function of exudative cells has already been discussed.

Proteins, such as fibrin, are essential for the bridgework of wounds. Proteins are also essential buffers in the physiochemical reaction of wounds. Gaza and Brandi (26) have shown that the action of autolytic enzymes is dependent upon an acid reaction. Moreover, acidity favors repair by producing more complete dissociation of oxygen. Herrmannsdorfer (39) has shown that wounds of animals on an alkaline diet swarm with bacteria. Reimers and Winkler shortened the period of wound healing by feeding dogs ammonium chloride.

Hormones. Reports in the literature on the effect of hormones on the healing of wounds are contradictory. The work of Aievoli (1) suggests that local application of hormones or endocrine-gland

substance — particularly testicular hormone or gland — favors wound healing. Lauber (51) was able to shorten the healing period by the injection of glandular extracts. The entire subject is somewhat confused, and more work is required to approach agreement on the effect of hormones on wound healing.

Nervous influences. More rapid wound healing is supposed to follow sympathectomy. Leriche and Haour (54) attribute the beneficial effects of sympathectomy to vasodilatation, and increased peripheral pressure and temperature. More recently this concept has been applied to the treatment of wounds in certain cases of peripheral vascular disease.

Neutropenia. Lawrence and Pearse (53) present evidence that experimentally produced neutropenia in guinea pigs does not affect the healing of an aseptic wound. In the presence of infection, however, their animals manifested a marked inability to cope with the healing process.

Disease. Many coexisting diseases are reported to have a deleterious effect on wound healing. Usually it is not the specific disease that is responsible, but rather some manifestation of it, such as the anemia and hypoproteinemia of nephritis and cancer, and the acidosis of nephritis and diabetes. Anemia, peripheral vascular disease, and arteriosclerosis interfere with oxygenation of the wound. Carrel (13) and Kiser (49) have demonstrated delay in wound healing caused by an infection far removed from the wound.

Diet. Mason (66) has stated, "The urge to heal is almost equal to the urge to live; nature will surmount all obstacles to close a wound." Morgan (71) in 1906 showed that a starved salamander could regenerate an amputated limb as rapidly as could a well-fed animal. Regeneration occurs at the expense of less active cells of the organism and the starved animal suffers atrophy of all its organs. Howes (42) and his coworkers studied the effect of complete and partial starvation on the rate of fibroplasia in wounds of adult rats and concluded that complete starvation did not alter the healing curve. However, in young rats, they found that complete or partial starvation did appreciably retard the rate of fibroplasia, and thus prolonged the proliferative phase and final healing. Clark (19) noted a short lag period in protein-fed animals, a prolonged lag period in fat-fed animals, and an intermediate lag period in animals fed with diets high in carbohydrates. Harvey and Howes (36) noted no change in the lag period in protein-fed rats, but the velocity of fibroplasia and the proliferation were stimulated. The effect of acid and alkaline diets has been mentioned.

Hypoproteinemia. In 1938, Thompson, Ravdin, and Frank (81, 82) showed that the hypoproteinemic dog is incapable of normal fibroplasia. Seventy-five per cent of the dogs in this study showed failure of wound healing or disruption of the wound. Fibroblasts did not appear until the seventh day. The results observed by these workers could be obviated by increasing the serum proteins to normal.

Hinton and Localio (40) have maintained rats on a protein-free diet for five weeks, during which time the plasma proteins were reduced 50 per cent. The lag period and period of final healing were prolonged in these animals, but disruption did not occur.

Vitamins. Saitta (79) has reported the absence of wound healing in experimental animals maintained on a diet deficient in vitamin A for prolonged periods prior to the operative procedure. In similar instances the delay could be abolished by applying vitamin A directly to the wound. Lauber (51) found that preoperative or postoperative treatment of rats with small doses of vitamin A did not affect the healing of skin wounds. Moderate daily doses given postoperatively accelerated wound healing. Large doses had an inhibitory effect. Ectodermal and endodermal structures (87) undergo pathological changes as a result of vitamin A deficiency. Most wound healing occurs in mesodermal structures, and the effect of vitamin A on their healing has not been studied. The local effect on wound healing of salves containing vitamin A, particularly cod-liver-oil salves, has been studied extensively. Loehr (58) observed beneficial results after local application of cod-liver oil in the healing of burns, and later (59) showed that these results were due to the unsaturated fatty acids and not to the vitamin A. Getz (27) found the effective fraction of fish oils in the nonsaponifiable residue, which was devoid of vitamins. More recently Ralli and Brandaleone (73) studied the effect of cod-liver oil applied locally to wounds of rats deficient in vitamin A. Healing was accelerated in the treated animals. The livers of treated and untreated animals showed no difference in vitamin A content. The authors conclude that some substance other than vitamin A is responsible for the stimulation of cod-liver oil applied locally.

Saitta (77) has reported that lack of vitamin B interfered with healing in pigeons and rats and that the oral administration or local application of B-concentrates nullified the delay. These results have not been confirmed. Lauber (52) noted no difference in healing of wounds between normal animals and those deficient in vitamin B.

Vitamin D has no apparent effect on wound healing except to cause delay when administered in large doses.

Marchesi (65) reports that vitamin E applied locally stimulates wound healing in rabbits. These results have not been confirmed.

Anson in 1748 (2) and Lind in 1772 (55) observed and recognized the delayed healing of wounds in scorbutic seamen deficient in vitamin C. In 1919 Aschoff and Koch (4) demonstrated that in scurvy there was a deficiency of intercellular substance and an inability to maintain existing supporting structures. Hojer (41) in 1924 was the first to suggest the necessity of vitamin C for normal wound healing, and presented experimental evidence in support of his statement. He further demonstrated the general atrophy of collagen in scorbutic guinea pigs. Saitta (77) in 1929 showed that wounds in scorbutic guinea pigs healed very slowly. Wolbach and his coworkers have carefully studied the relationship between vitamin C and collagen formation. During a study of wounds in scorbutic guinea pigs, it was noted that there was no delay in the time of appearance and no decrease in the number of fibroblasts. Collagen formation, however, was poor and only a few capillaries were formed. Wolbach (88) concluded that in scorbutus there is a failure of the cells to produce intercellular substance. This is due to the absence of an agent common to all supporting tissues and necessary for the gelation of collagen. Later Wolbach (86) noted that the failure of collagen formation could be corrected by the administration of orange juice to scorbutic animals. More recently this author (70) asserted that since ascorbic acid is a potent reducing agent, lack of intercellular substance may be an expression of reduced cellular oxidation resulting from the deficiency of vitamin C.

The pathological changes resulting from vitamin C deficiency (87) occur in cells of mesodermal origin. The intercellular substances affected are the collagen of fibrous tissues, matrices of bone, dentine and cartilage, and the nonepithelial cementing substances, including vascular endothelium. The reparative and proliferative power of epithelial cells, endothelium, and fibroblasts is not affected. Jeney and Törö (48) have shown that in fibroblast explants, collagen fibrils increase markedly following the addition of cevitamic acid to the culture media. Lanman and Ingalls (50) have applied these findings to a study of the tensile strength of wounds of scorbutic animals, and found that the increase of wound strength during the proliferative phase was markedly retarded. They suggested further that vitamin C deficiency might be a factor in wound disruptions. These results have been confirmed by Taffel and Harvey (80). By utilizing the well known affinity of precollagen for silver stains, Hunt (46) has shown that precollagen devoid of holding power is the variety laid down in scorbutic animals, and that the collagen of a normally healed wound reverts to precollagen if scurvy supervenes. Lund and Crandon (61), in a like experiment performed on one of the authors, showed that a wound could heal normally after three months on a diet free from vitamin C. After six months on the same diet a typical scorbutic wound was obtained. Clinical scurvy was not apparent until the fifth month. This study shows that the vitamin C deficiency must be of long duration before wound healing is impaired. In 19 cases of evisceration, Hartzell, Winfield, and Irving (35) found low vitamin C values in the blood.

LOCAL FACTORS

Trauma. When the surgeon leaves traumatized and devitalized tissue in his wake, because of rough handling, mass ligation, undue retraction, crushing of tissue with large instruments, and forceful blunt dissection, numerous islands of necrosis occur. The necrotic tissue must be destroyed or the phases of destruction and lag period will be prolonged and the proliferative phase and final wound healing retarded. The processes of autolysis and heterolysis must be more active and larger numbers of migratory cells are required to débride the wound. Defects within the wound due to the death of tissue must be repaired by granulation, and therefore the process of healing must be more intense and widespread. As a consequence, the patient exhibits a febrile reaction, serum production in the wound is excessive, and islands of necrotic tissue in a lake of plasma afford a favorable environment for the proliferation of bacteria which are present in all wounds.

Blood supply. Restriction of the blood supply to any wound, due either to trauma or unwise ligation of the blood vessels, affects wounds as much as does trauma alone. The devascularized areas must become necrotic and destroyed, and absorbed or extruded.

Hematomas. Hematomas interfere with proper wound healing by preventing apposition of the edges, by prolonging the phase of destruction, and by acting as culture media. Furthermore, the clot interferes with the local circulation through pressure upon the vessels (67). Halsted (30) has pointed out the need of meticulous hemostasis as a requisite to good wound healing. Reid (74) and Mason (66) call attention to the fact that each

ligation produces an additional island of necrosis and adds more foreign material to a wound. They suggest that minor bleeding and oozing be controlled by pressure and that all other bleeding vessels be ligated. Both authors advocate that wounds be dry before closure, and warn against the ill effects of hematomas.

Chemicals. The use of chemicals for antisepsis should be limited. Most chemicals capable of destroying bacteria also destroy tissue.

Electrosurgery. Ellis (23), Magyary (64), and Hauberisser (38) have shown that after electrosurgery, or electrocoagulation for hemostasis, the destructive phase is prolonged and wound healing is delayed. Fibroplasia is withheld until the necrobiotic zone produced by the current is removed.

Suturing. Suturing under tension or with undue tension causes necrosis along the suture line with results similar to those just described.

Foreign bodies. The use of unnecessarily large drains and of excessive amounts of large-calibered suture material prolongs the lag period and delays fibroplasia, possibly causing suppuration. Foreign bodies must be absorbed, encapsulated, or extruded (84).

Inadequate apposition. In case of inadequate apposition, dead space must be filled in by granulation. This phase of healing is therefore prolonged.

Dehydration. Exposure of wounds to the warm dry air of the operating room and the heat of the operating lights causes dehydration and death of the superficial layers of the exposed areas, and thus adds unnecessary necrotic tissue to the wound and prolongs the destructive phase.

Infection. Although the days of "laudable pus" have passed, Meleney (69) has shown that, unless infinite care is exercised, infection occurs in from 10 to 15 per cent of all clean wounds. He estimates that from 35,000 to 60,000 bacteria fall upon a sterile field during the course of a one-hour operation. He points out that contamination is usually air-borne and consequent to inadequate masking, dust traps, air currents, street clothing, and the absence of canopies. Hart (34) and his coworkers have attempted to combat this air-borne contamination by exposing the wound to ultraviolet radiation. Devonish and Miles (20) discuss the relationship of glove puncture during operation to postoperative wound infection. These authors have shown glove puncture to be as high as 24 per cent. Ives and Hirshfeld (47) have shown that at operation all clean wounds are extensively contaminated with bacteria.

Obviously, a large percentage of clean surgical wounds become contaminated, and in accidental wounds the percentage is probably higher and the number of contaminating organisms greater. Mason (66), Whipple (83, 84, 85), Maes (63), and others have stressed the fact that the healthy wound can successfully exterminate bacteria, but a wound containing old blood, serum, and devitalized tissue becomes an admirable culture medium for bacteria.

The problem of the prevention of wound infection is related, therefore, not only to asepsis but also to the mechanism of surgical technique. Experience in World Wars I and II has demonstrated the necessity of excising devitalized, traumatized, and contaminated tissue in order to obtain primary healing of traumatic wounds. In clean wounds the devitalization of tissue can be prevented. Bacteria destroy tissue because of their ability to produce enzymes that can digest tissue into proteoses and peptones suitable for bacterial diet. This destroyed tissue, together with bacteria, bacterial toxins, and dead leucocytes must be removed from the wound. The destructive phase of healing is thereby greatly prolonged. The proliferative phase is retarded and extended because areas in which tissue has been destroyed must be filled by granulation.

Immobilization and rest. Mason (67) has stated that motion during the lag period of wound healing disrupts the fibrin bridge and prolongs the lag period. During the proliferative phase motion may stretch the newly forming scar, with resultant weakening of the delicate new tissues.

Suture material. The effect of suture material on the processes of wound healing will be discussed in a later section.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Berger, A.: Fractures of the Mandibular Condyle. *J. Am. Dent. Ass.*, 1943, 30: 819.

This report is based upon a study of about 75 cases of fracture of the condyle. While fractures of the condyle are not so common as fractures which occur in other parts of the mandible, automobile and industrial accidents account for an increased number. If there is no marked displacement of the fragments, the symptoms, signs, and discomfort may be so slight as to be easily overlooked. In unilateral fractures, the clinical sign most frequently observed is a shift in the line of occlusion (and the mandible) toward the injured side when the mouth is opened. Usually there is a gap between the anterior teeth. In bilateral condyloid fractures, the mandible is drawn backward and upward by muscle traction and there is a V-shaped gap between the anterior teeth. One of the important clinical means of diagnosing these fractures is by palpation of the head of the condyle in motion, either directly over the condyle or by placing an index finger in each auditory canal. Bleeding from the external ear may occur.

The line of fracture in these cases frequently passes through the mandibular notch to the posterior border of the ascending ramus. Many fractures occur above this landmark at the articular head or surgical neck. The head of the condyle may or may not remain in the mandibular fossa. Roentgenograms are always to be depended upon in the diagnosis of the fracture.

In reducing these fractures, two distinct functions should be borne in mind: (1) free movement at the temporomandibular joint, and (2) the occlusion of the teeth. If the fragment cannot be brought into a satisfactory position by manipulation to attain these two functions, it should be removed completely by an open operation. Open reduction is not advised. Immediate complete fixation can be obtained by one of the various methods of intermaxillary wiring. Intricate appliances can be the source of many complications and are at best not always so effective as are the tried and proved simpler methods of fixation.

LOUIS T. BYARS, M.D.

EYE

Duncan, W. J. L.: Ocular Injuries of Soldiers in the Middle East. *Austral. N. Zealand J. Surg.*, 1943, 12: 235.

The author reports on ocular injuries of soldiers in the Middle East. He reviews the ocular injuries of 55 soldiers admitted to an Australian general hospital during the Libyan campaign of 1941. These patients usually arrived at the hospital from one to two weeks after injury. Fifty-five soldiers with a perforating injury of one or both eyes were admitted. Some eyes were so disorganized that excision had to be performed at once. In many cases both eyes had been penetrated, often without external evidence, and projections of stone and sand were present in the eyes. Intraocular foreign bodies were not always demonstrable by x-rays, and were feebly magnetic or nonmagnetic; foreign bodies were often multiple in about 1 of 4 cases. Wounds of the face and other parts of the body were frequent complications.

The author points out that there were no cases of sympathetic ophthalmia and that successful treatment usually depended on early admission to a hospital.

JOSHUA ZUCKERMAN, M.D.

Cogan, D. G.: Lewisite Burns of the Eye. *J. Am. M. Ass.*, 1943, 122: 435.

The author reports 2 cases of lewisite burns of the eye in which ocular lesions occurred as a result of exposure to lewisite under field conditions. In an open field in the early afternoon of a day in the middle of January, with a temperature of 25°F., a 100 cc. ampule of 5 per cent lewisite in chloroform was exploded from 50 to 80 feet from a group of 33 observers standing downwind to the explosion. In a few minutes indicator paper held by the observers showed droplets indicating the presence of liquid lewisite. Ten observers developed cutaneous lesions, 2 developed ocular lesions, and 10 developed lacrimation.

Cogan points out that lewisite and mustard gas are vesicants which may be used in the present war. In man, the chief difference between them concerns the interval of time that elapses between exposure to these chemicals and the onset of symptoms. With mustard gas, symptoms do not occur for several hours after exposure; with lewisite the reaction is immediate. Moreover, mustard gas may be absorbed by the cornea over a considerable time and produce a cumulative effect, while lewisite is washed away by the immediate tearing. The chief ocular lesions resulting from lewisite occur in the superficial parts of the cornea and the damage is not permanent.

JOSHUA ZUCKERMAN, M.D.

Kolen, A. A.: Soviet Military Ophthalmology. *Lancet*, Lond., 1943, 244: 804.

The high percentage of injuries to and about the eyes in modern warfare caused the Soviet medical authorities to take special steps, even before the present conflict, to be prepared for the care of these cases. Special attention was devoted to the training

of ophthalmologists in ocular traumatology, x-ray diagnosis of intraocular foreign bodies, use of the electromagnet, and plastic operations about the eye. Base hospitals were required to have complete ophthalmological equipment, including giant electromagnets. The departments of ophthalmology, otolaryngology, and stomatology were so grouped that they could work together in treating wounds of the face, and this has proved of great benefit.

A number of simplified plastic operations have been devised at the Novosibirsk Eye Clinic. The reconstruction of the conjunctival sac, if the smallest fraction remains, is usually done without the grafting of new tissue. After cutting through the depth of the remains of the conjunctival sac and separating the conjunctiva, the divided sac is stretched by means of thick silk sutures, a prosthesis is inserted, and the sutures are tied over it. Epithelization of the wound without shrinkage then takes place and enables the patient to wear an artificial eye. The "transplantation flap method" is used for defects and adhesions of the conjunctiva, especially after burns. A small piece of mucous membrane from the lip is transplanted to a gap in the skin near the lid border. The gap is made by means of an incision in the skin, with undermining. After this has "taken," the area of lid skin, with the mucosal surface, is transferred on a pedicle to the area of the defect. A similar method is used for reconstruction of the eyelids, and a slice of cartilage is interlaced between the skin and mucosa before the pedicled flap is made.

Contrary to the usual custom of performing a plastic operation only after complete shrinkage of the scar, which may take from twelve to eighteen months, these operations are usually done within from two to four months after the injury. The results have been satisfactory and there has been a great speeding-up of war cases, with the return of men to the military or labor front. In expediting the disappearance of unsightly scars, not only are the usual physiotherapeutic agents employed, such as massage and the quartz lamp, but extensive use is made of "paraffinotherapy." This treatment has also been found useful postoperatively in speeding up healing and improving the results of the operation.

Wounds of the ciliary body may be treated by excision of the prolapsed portion if the eye retains vision, and may be saved. A case is mentioned in which a sarcoma of the ciliary body was removed without loss of vision in the eye. The author believes that this procedure opens up a new phase of ophthalmic surgery and that removal of a part of the ciliary body after prolapse may save many eyes.

Blood transfusions appear to be widely employed by Soviet ophthalmologists in the treatment of eye wounds, especially after trauma to the ciliary body, and "in the treatment as well as prevention of sympathetic inflammation in the sound eye." Blood transfusion is recommended also for the treatment of vitreous opacities.

Mention is made of the use of "albucid," one of the sulfonamides, in the treatment of infected injuries of the anterior part of the eye. Vitamin K is used in cases in which there is danger of hemorrhage.

WILLIAM A. MANN, M.D.

Bock, R. H.: Diabetic Retinosis in the Chinese. *Arch. Ophth.*, Chic., 1943, 29: 919.

There has always been some disagreement as to whether the typical fundus findings of diabetic retinopathy are due to the diabetes or to the complicating vascular and renal pathology. Since hypertension and arteriosclerosis are much less common among the Chinese than among inhabitants of the western hemisphere, and diabetes appears to be less severe—probably because of dietary rather than racial differences—the author chose to study and analyze the records of diabetic patients in the Peiping Union Medical College Hospital.

Of 183 cases of Chinese diabetic patients studied, 49 showed diabetic retinopathy. The greatest incidence was found in patients between fifty and sixty years of age. These patients had been diabetic for an average period of seven years prior to the onset of the retinopathic changes. No important differences were noted between the two sexes. The blood sugar content was significantly higher in the patients with retinal complications than in those without, but there were no important differences in hypertension, arteriosclerosis, acetone bodies, cholesterol, or impairment of renal function between the two groups.

The author concludes that there may be damage to the capillaries when a high hyperglycemia has persisted for a considerable period of time, and that this damage predisposes to the retinal changes, although no proof has as yet been offered which would make this more than an interesting theory.

WILLIAM A. MANN, M.D.

Bellows, J. G.: Chemotherapy in Ophthalmology. *Arch. Ophth.*, Chic., 1943, 29: 888.

In discussing the use of chemotherapeutic agents in ophthalmology, the author notes that practically no reference has been made to the use of penicillin in ophthalmology, although this substance may prove to be of great value since it is approximately four times as potent as sulfathiazole and far less toxic than the sulfonamides, while its action is not inhibited by pus, secretions, and large numbers of organisms. He was unable to obtain any penicillin for experimental study, but he found that tyrothricin (15 per cent gramicidin and 85 per cent tyrocidin) in 0.5 per cent suspension was nonirritating when placed in the conjunctival sac; in higher concentration, however, it did cause irritation and even cloudiness of the cornea. Clinically it was used in several cases of conjunctivitis with unimpressive results. Further clinical investigation seems to be warranted.

Investigation of the four most commonly used sulfonamides—sulfanilamide, sulfapyridine, sulfathiazole, and sulfadiazene—reveals that the highest blood and ocular concentration is reached with sul-

fanilamide. It is only with sulfanilamide and sulfapyridine, given orally, that one may be reasonably certain of effective concentration in the ocular tissues and fluids, although it has been shown that concentration of all these drugs may be increased by the application of heat or mecholyl, or by paracentesis in the presence of inflammation.

Local use of the drugs, except for sulfanilamide, fails to give as high an intraocular concentration as does the oral method.

The author has arrived at the following practical conclusions with regard to the use of the various sulfonamides in ophthalmology:

1. For intraocular infections, sulfanilamide and sulfapyridine given orally, sulfanilamide used topically, or any of the 4 drugs employed with iontophoresis or with a wetting agent, will provide an adequate concentration.

2. For conjunctival and corneal disease, any of the 4 drugs in powder or ointment form will give an adequate concentration.

In addition to the toxic effects of the sulfonamides, such as transient myopia and optic neuritis, it should be noted that the sulfonamides, used locally in the eye, not only cause delay in healing of corneal epithelium but produce highly vascularized scars.

Sulfonamide therapy, by the oral method, has been found clinically useful in the treatment of the ocular complications of erysipelas, gonorrheal ophthalmia, trachoma, inclusion blenorrhea, ophthalmitis due to lymphogranuloma venereum, serpent ulcer, cellulitis of the lids and orbit, endophthalmitis, panophthalmitis, and sympathetic ophthalmia.

Applied locally, the sulfonamides are useful in treating pyogenic dermatoses, infectious blepharitis, and some forms of acute conjunctivitis.

Although the sulfonamides have proved to be the most important addition to the armamentarium of the ophthalmologist since the introduction of the organic arsenicals, they should not be used indiscriminately nor considered a panacea.

WILLIAM A. MANN, M.D.

Klein, M., and Sorsby, A.: The Sulfonamides in Experimental Ocular Infections. *Brit. J. Ophth.*, 1943, 27: 241.

The authors discuss the sulfonamides in experimental ocular infections. They point out that:

1. Sulfanilamide solution (instilled into the conjunctival sac or introduced into the anterior chamber), sulfanilamide ointment (5 per cent), and sulfanilamide powder are well tolerated by the eye.

2. The effectiveness of the various types of sulfonamides on the eye varies in accordance with the ability of the substance to penetrate the eye from the bloodstream—for example, the aqueous fluid level of sulfanilamide and of sulfapyridine is two-thirds that of the blood level, that of sulfadiazine is one-half, and that of sulfathiazole is one-fifth.

3. With sulfanilamide solution given locally the level of concentration in the aqueous is lower than that obtained by oral administration of the drug, but this level is not readily maintained on account of the diffusibility of the drugs.

4. With insufflation of sulfanilamide powder into the conjunctival sac higher levels are obtained than with oral administration.

5. Instillation of sodium sulfacetamide (a soluble sulfanilamide) yields a higher aqueous concentration than that obtained by oral administration of the sulfonamides. Moreover, by instillation toxic symptoms are avoided.

The authors review the experimental control of corneal and intraocular infection by the general administration of sulfonamides for lesions caused by the streptococcus hemolyticus and the bacillus pyocyaneus, and the efficacy of local treatment with sulfonamides in lesions caused by the streptococcus hemolyticus, the bacillus pyocyaneus, and the staphylococcus aureus.

They attempt to determine the efficacy of the sulfonamides in the local treatment of ocular infections and to compare the value of local treatment with that of general administration of these drugs in rabbits. Corneas were infected experimentally with the bacillus pyocyaneus, and streptococci were introduced into the anterior chamber.

It was concluded that in the absence of a more standard technique of introducing experimental infection of the cornea, the relative therapeutic value of general and local administration of the sulfonamides cannot be determined with any degree of accuracy.

JOSHUA ZUCKERMAN, M.D.

EAR

Proctor, B., Lindsay, J. R., and Gonne, W. S.: Sequestration of the Osseous Labyrinth. *Arch. Otolar.*, Chic., 1943, 37: 819.

Invasion of the inner ear and sequestration of the bony labyrinth as a complication of pyogenic suppuration has occurred most frequently in the presence of an extensively developed air-cell system extending into the petrous pyramid. The presence of pneumatized areas behind and above the labyrinth, or in the apical region of the pyramid, creates the possibility for foci of suppuration to persist in these regions despite exenteration of the mastoid air cells. Such foci may persist as chronic suppuration, or, if drainage is sufficiently impaired, may by direct extension produce an intracranial complication or erosion of the labyrinth capsule and labyrinthitis.

When the labyrinth is invaded the end organs are eventually destroyed. Such foci of suppuration around the labyrinth predispose to sequestration. Facial paresis usually occurs.

The presence of diabetes mellitus predisposes to the extension of suppuration and complications.

Treatment varies with the stage of the disease. Signs of invasion of the labyrinth urgently indicate surgical exenteration of the focus in the cell system. Foci of suppuration in the pyramid may require drainage as well as such foci in the mastoid. In later

stages, labyrinthectomy, removal of the sequestra (if loose), and decompression of the facial nerve may be indicated. X-ray studies are valuable in determining the extent of pneumatization and may demonstrate sequestration of parts of the labyrinth.

Four cases are reported. In 2, the condition followed scarlet fever; in 1, it occurred during an acute exacerbation of a chronic suppuration; and 1 case occurred in a diabetic patient. In all 4 cases the labyrinth had been destroyed, and all of the patients had facial paresis. In the diabetic patient, a radical mastoidectomy with removal of the sequestrum and decompression of the facial nerve resulted in a healed ear and the return of facial movements after a period of eight months. In the 3 other patients, the presence of suppuration in pneumatized areas around the labyrinth was the predisposing factor to invasion of the labyrinth. The development of the sequestrum was diagnosed by means of x-rays in 1 case and at operation in the others. Two patients had also an intracranial complication; 1 had meningitis and recovered and 1 died of probable cerebellar abscess.

NOSE AND SINUSES

Lederer, F. L., and Dinolt, R.: Influence of Avulsion of the Trigeminal Nerve on the Human Nose. *Arch. Otolar.*, Chic., 1943, 37: 768.

No inference should be drawn from this article as to the role of the autonomic nervous system in trophic control of the nose. The limits of its influence have not been definitely established, nor have all of its connections been determined. Most authors neglect the possibility of another autonomic nerve pathway to the nose, namely, the terminal nerve. The rich supply of autonomic fibers in this nerve and its interlacing connections with the trigeminal branches suggest relays of impulses, a possibility which has been neglected in most experimental denervations. Therefore, this investigation, conducted on a small scale, shows that sensory denervation of the nasal mucosa produced by the retrogasserian avulsion of the sensory branch of the trigeminal nerve does not have any major influence on an eventual pathological condition of the nose nor does it result in any permanent changes in the mucosa.

The nasal history, the observations on the nose, and the results of biopsy of tissue taken from the turbinates of 10 patients in whom the sensory root of the trigeminal nerve had been sectioned five months to thirty-nine years previous to this investigation are reported.

Neither the histories nor the observations permit any special conclusions to be drawn. Anesthesia of the affected side was noted in 9 patients and hypesthesia in 1 patient. No major pathological change was noted. Histological study failed to reveal any differences between the two sides of the nose, except for a possible decrease of mucoid degeneration in the nasal epithelium on the side of operation. Neither the vessels nor the glands showed changes which could be attributed to the lack of trigeminal fibers, nor was there a perceptible change in nasal secretion, ulceration, or crust formation.

The possibility that the terminal nerve as a part of the autonomic nervous system exerts a greater influence than has been generally considered is suggested.

It has been established that trigeminal denervation is not followed by either temporary or permanent damage to the nasal mucosa, nor does it predispose to a pathological condition of the nose.

JOHN F. DELPH, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Adams, R. D.: Occlusion of the Anterior Inferior Cerebellar Artery. *Arch. Neur. Psychiat.*, Chic., 1943, 49: 765.

The clinical and pathological observations in a case of thrombosis of the anterior inferior cerebellar artery are reported. A man, aged forty-eight, suddenly experienced dizziness followed by tinnitus, nausea and vomiting, and right facial paralysis. The essential findings on admission to the hospital one week later were: complete facial paralysis, Horner's syndrome, and complete nerve deafness on the right side; well sustained nystagmus on lateral gaze to either side and left rotary nystagmus on upward gaze; impaired pain and temperature sense over the right side of the face; and cerebellar ataxia in the use of the right arm and leg. Pain sensation was inconstantly diminished on the left side of the neck and on the left arm. Neurological examination several times during the course of four weeks' treatment for congestive heart failure yielded about the same results. Death occurred from complications of heart disease twenty-five days after onset of the cerebellar symptoms.

Post-mortem examination revealed cerebral arteriosclerosis and encephalomalacia; thrombosis of the right anterior inferior cerebellar artery with infarction of the lateral part of the medulla oblongata and cerebellum; thrombosis of the lateral branch of the left posterior inferior cerebellar artery with infarction of the cerebellum; and multiple small softenings in the basis pontis, midbrain, and lenticular nuclei. The occlusion of the anterior inferior cerebellar artery was complete. The histological changes observed at various levels are described.

The palsies of the seventh and eighth cranial nerves were the result of involvement of the respective nuclei and their nerves; the vertigo, nausea, and vomiting were ascribed to lesions of the vestibular nuclei and their connections with the nuclei of the vagus and oculomotor nerves; ipsilateral loss of pain and temperature sensation, and corneal hypesthesia were the result of interruption of the spinal tract and nucleus of the trigeminal nerve; and hypesthesia over the cheek was best explained by the involvement of some of the entering fibers of the trigeminal nerve. The absence of complete contralateral hypalgesia and thermohypesthesia was due to the extreme lateral and posterior position of the lesion which spared most of the lateral spinothalamic tract. Horner's syndrome was related to the interruption of pupillodilator fibers which are known to descend ipsilaterally from the hypothalamus and to converge in the lateral portion of the pons and medulla before continuing downward to connect with the upper thoracic sympathetic motor cells. Since both the inferior and middle cerebellar peduncles were involved, the signs of cerebellar ataxia could not be assigned to a lesion of a single structure in the brain stem. A table illustrating the differences in the syndromes resulting from occlusion of the three cerebellar arteries is presented.

JOHN L. LINDQUIST, M.D.

Williams, H. W., and Berwald, W. P. E.: Glioblastoma Multiforme. Report of 3 Cases. *Am. J. Surg.*, 1943, 60: 447.

The outlook for the highly malignant glioblastoma of the glioma group is usually regarded as poor. However, 3 cases are reported in the last two and one-half years by the authors. Apparently, complete, radical removal of the type of tumor in question was successfully accomplished. One patient has now survived two and one-half years; another, one year; and a third, eight months since operation. All of the patients were right-handed and had right postfrontal gliomas. In each case the histological diagnosis was glioblastoma multiforme. Two of the patients were subjected to intensive x-ray therapy. It is interesting to note that in 1 of the patients the examination of the nervous system was objectively negative, and that in this case only the introduction of air into the ventricular system confirmed the diagnosis.

The authors are of the opinion that in every case of glioma, a large subtemporal decompression should be done, whether the tumor is successfully removed or not. They believe, also, that the excision of cerebral tissue should be carried at least a centimeter beyond the visible margins of the growth at all points. Only tumors in certain locations are suitable for extensive surgical measures; in the attempt to remove tumors in other locations, the end-results must be constantly kept in mind with reference to the patients' and relatives' attitude toward an individual who may live, but who may be unable to care for himself.

ADRIEN VERBRUGGHEN, M.D.

PERIPHERAL NERVES

O'Connell, J. E. A.: Sciatica and the Mechanism of the Production of the Clinical Syndrome in Protrusions of the Lumbar Intervertebral Discs. *Brit. J. Surg.*, 1943, 30: 315.

It is believed that the hypothesis that the typical intervertebral-disc protrusion produces symptoms by stretching the extradural portion of a related intraspinal nerve, provides a ready explanation of the clinical features associated with this lesion. While compression may have some bearing, it is considered that the large lumbar canal can accommodate protrusions of such size as usually occur without the production of pressure on any of its contents; the dura and its contained roots are displaced, but the possibility of displacement of the extradural

nerve is limited and, therefore, it is stretched when the limit of its mobility is reached. When the protruded disc is of large size and the extradural roots are relatively mobile, it is obvious that one of them may be carried posteriorly by the protrusion and compressed between this and the vertebral lamina or ligamentum flavum. Adhesion between the nerve and the protrusion is sometimes found. When this occurs, it limits the possibility of displacement of the nerve over the protrusion into positions of relaxation, and this would be likely to contribute to the symptoms. Friction between the nerve and the protrusion may also aggravate the symptoms. It is believed, however, that stretching of the affected nerve is the most important factor.

From the anatomical observations, it may be said that the extradural intraspinal nerve roots in the lumbar region are placed in the extreme anterolateral portion of the spinal canal and that they resist forces which tend to displace them from this position. This resistance is due to the normal state of tension existing in the nerves. The tension is due partly to the structure of the extradural nerve and partly to the proximity of its upper and lower attachments—both of which are relatively fixed. The degree of this tension is not constant but varies with varying postures of the head, trunk, and limbs.

The embryological, morphological, and clinical evidence upon which is based the hypothesis that stretching of an extradural nerve is the cause of the clinical syndrome in intervertebral-disc protrusions is discussed in detail. In virtue of its anatomical situation, its structure, and its attachments, an extradural nerve is early affected by lesions in its neighborhood. The only common lesion in this situation is an intervertebral-disc protrusion. It displaces the related nerve to some extent, but the displacement is strictly limited, and, consequently, as the disc protrusion enlarges, the extradural nerve is stretched over it between its relatively fixed attachments. Only one extradural intraspinal nerve will usually be related to a disc protrusion. It is believed that the characteristic clinical picture of lumbar disc protrusions is largely due to the tension in this extradural nerve produced by the protrusion, and to factors which modify the degree of such tension.

Features of the clinical picture which cannot readily be explained otherwise are considered in the light of the hypothesis. When certain lesions have been excluded, the presence of this clinical syndrome allows of the diagnosis of protrusion of a lumbar disc without the need of contrast roentgenography. Indeed, in many cases it can be decided on clinical grounds whether the fourth or fifth disc is involved. When the fourth disc is involved the paresthesia and objective numbness may involve the medial portion of the dorsum of the foot and the ankle jerk may be unaffected. When the fifth disc protrudes, the sensory disturbance is placed farther laterally on the foot and the ankle jerk may be diminished or absent. This difference in clinical pictures is due to the fact that a protrusion of the fourth disc largely involves the fifth lumbar root, while a protrusion of the fifth disc especially affects the first sacral root. It may be difficult, however, to decide on clinical grounds whether the protrusion has occurred at the fourth or the fifth disc. ROBERT P. MONTGOMERY, M.D.

SURGERY OF THE THORAX

TRACHEA, LUNGS, AND PLEURA

Behrend, M.: Total Pneumonectomy for Pulmonary Tuberculosis. *J. Thorac. Surg.*, 1943, 12: 484.

The author, after reviewing the literature, reports the following case of total pneumonectomy for pulmonary tuberculosis.

A woman, forty-five years of age, had a diagnosis of pulmonary tuberculosis established by means of x-rays in 1937. She had atelectasis of the left lower lobe due to a stenosis of the bronchus. A small cavity in the left upper lobe was present with positive sputum. Pneumothorax gave a fair collapse with closure of the cavities, and the sputum became negative. Repeated bronchoscopic examinations revealed stenosis of the bronchus, the dilatation of which was never entirely successful in emptying of the cavities. Thoracoplasty was decided against. The patient was treated at home for three years, during which time the sputum was negative for acid-fast bacillus for about three years. The bronchus was dilated once every six weeks, however, and later this procedure became necessary every two weeks. The patient then became dyspneic at rest and on mild exertion, with frequent nonproductive paroxysms of coughing.

In November, 1941, the left lung was removed without drainage. Five grams of sulfanilamide were dusted over the hilar stump. The pathological diagnosis was "fibrocaseous tuberculosis with bronchiectasis." Eighteen months following the operation, the patient was in good health.

EARL O. LATIMER, M.D.

Rigler, L. G.: The Infected Lung Cyst. *Radiology*, 1943, 40: 485.

Cystic disease of the lung, considered chiefly of academic interest two decades ago, is now found to be of frequent occurrence and a real clinical problem. Cysts may be either congenital or acquired, single or multiple, and they may contain fluid, gas, or both. Although not infected at the onset the likelihood of secondary infection from an inflammatory process is quite considerable.

The true lung cyst is usually lined with bronchial epithelium which secretes fluid, which explains the presence of fluid within the cyst. If a communication with the bronchial tree is present, fluid and gas may both be present. If drainage is adequate only gas is present.

Because of the bronchial communication secondary infection is always possible. The author reports 5 cases of cystic disease of the lung, illustrating various features regarding this lesion. The first case revealed the development of a bronchial communication and a fluid filled cyst. In the second case the difficulty of differentiating an infected lung cyst from a loculated empyema was notable. In the third case a diagnosis of encapsulated empyema was made but drainage failed to cure the patient, the true nature of the condition being discovered later. In the fourth case an opportunity was presented for observing the development of gas-containing cysts which later became infected and simulated multiple lung abscesses. In the fifth patient an encapsulated empyema failed to heal following drainage. A correct diagnosis of infected cyst was made by biopsy of the cyst wall. The patient was subsequently cured by lobectomy.

The best method for obtaining a permanent cure of cysts of the lung is by extirpation of the portion involved. Infected cystic disease should be suspected in all cases in which suppurative cavities do not respond to drainage. WILLIAM E. ADAMS, M.D.

Robertson, C. K.: Lung Cancer and Early Diagnosis. *Edinburgh M. J.*, 1943, 50: 296.

Carcinoma of the lung ranks second only to carcinoma of the stomach in frequency, the death rate from this condition in Scotland increasing from 437 in 1935 to 559 in 1940. An early diagnosis is dependent upon the family doctor, the diagnostic aids being the x-rays, lipiodol instillation, bronchoscopy, biopsy, and exploration. The present report deals with 52 patients, ranging from forty to seventy years of age. Thirty-seven were males and fifteen were females.

The early complaints included pain in the chest, 20; cough, 14; breathlessness, 8; hemoptysis, 5; and other complaints, 5. The type of pain varied considerably, from annoyance to shooting pains or neuritis. The family doctor was able to diagnose the condition correctly in 42 per cent of the 52 patients, outside of the hospital, which was a highly commendable finding.

Hope for complete cure of this condition lies in complete removal of the malignant lung, and when carried out offers a 40.5 per cent recovery rate. Of the x-ray records of the 52 cases, 30 were positive or highly suggestive of bronchial carcinoma, 10 showed pleural effusions, 3 showed chiefly collapse, 3 showed bronchiectatic conditions, and the remaining 6 were not of value.

One of the most important factors in the progress of curative treatment in this condition is that of making the public more cancer conscious.

WILLIAM E. ADAMS, M.D.

ESOPHAGUS AND MEDIASTINUM

Hurst, Sir A.: Nervous Disorders of Swallowing. *J. Lar. Otol.*, Lond., 1943, 58: 60.

Hysterical dysphagia. The author believes this condition is rare and that the majority of cases are examples of upper dysphagia and syndromes of Paterson rather than true dysphagia. The esopha-

gus is sensitive to thermal and distention stimuli, and since it is relatively fixed the localization of sensory response is accurate. When hysterical dysphagia occurs the individual has had an incident which draws his attention to the normally automatic act of swallowing. The author reports a case of his own as representing one of the few cases of true hysterical dysphagia which he has seen.

Dysphagia in organic nervous diseases. Dysphagia may occur in various organic nervous diseases as a result of paralysis of the muscles concerned in the first and second stages of swallowing. The esophagus itself and the cardiac sphincter are never involved. In diphtheria of faucial origin, the toxin ascends by the lymphatics of the nerves to the central nervous system and causes a nuclear paralysis in the second week. This may cause paralysis of the soft palate and the rare pharyngeal paralysis.

Motor neurone disease, which includes progressive muscular atrophy and amyotrophic lateral sclerosis, may be accompanied by dysphagia if the vagal nucleus is involved in the last stages of the common form which begins in the muscles of the hands. It occurs in progressive bulbar palsy and myasthenia gravis. In the motor neurone disease the slowly progressive paralysis is unaffected by any treatment and there is no variation in the course of each day. In myasthenia gravis there may be periods of spontaneous improvement. Ephedrine sulfate, prostigmine, and nasal tube feedings are the therapeutic measures available. Dysphagia is also a symptom of the acute bulbar paralysis which may follow vascular or inflammatory lesions involving the nucleus ambiguus. In all forms of dysphagia due to organic nervous diseases, food of porridge consistency is most easily swallowed.

Upper dysphagia with the anemia syndrome of Paterson. The occurrence of upper dysphagia in anemic women was first recognized by D. R. Paterson in 1906. Paterson described the associated atrophic condition of the mucous membrane of the tongue which was missed by Plummer and Vinson, who unjustifiably regarded the condition as hysterical.

Paterson's syndrome is much the most frequent cause of upper dysphagia and occurs in about 15 per cent of the cases of simple achlorhydric anemia, which is common in women, especially between the ages of thirty and fifty, but rare in men. Usually the dysphagia is minor. The syndrome is the direct result of iron deficiency, which causes not only anemia, but also atrophy of the mucous membrane of the tongue and pharynx, cracks at the angles of a stiff and narrow mouth, loss of teeth, and spoon-shaped brittle nails. The atrophic condition of the pharyngeal mucosa results in a loss of sensibility so that the afferent side of the reflex upon which the second stage of swallowing depends is impaired. The pharyngoesophageal sphincter is particularly involved, the normal relaxation which allows the passage of food from the pharynx into the esophagus failing to take place (achalasia), or being replaced by spasm.

Iron therapy is indicated in sufficient amount to overcome the anemia and often to restore the atrophic epithelial tissues to their normal condition even when this occurs in the absence of anemia. If treatment is delayed, the atrophic pharyngeal mucosa may contract and aggravate the dysphagia by adding a mechanical to the neuromuscular disorder, and in long-standing cases the atrophied tissues may undergo malignant degeneration. The anemia may persist with or without dysphagia from five to twenty years before the onset of malignant disease.

The administration of iron in Paterson's syndrome can be regarded as a means of prophylaxis against epithelioma of the mouth of the esophagus.

The cardiac sphincter. The author states that there is definitely an anatomic sphincter as well as a physiological one. Regardless, the esophagus, including the cardiac sphincter, has a double functional nerve supply: the sympathetic which leads to contraction of the sphincter, and the vagus which causes normal relaxation of the sphincter.

Achalasia of the cardiac sphincter. The commonest nervous disorder of swallowing is achalasia. This results in retention of food and saliva, dilatation, violent peristaltic efforts, and, finally, muscular hypertrophy. There is no organic obstruction and there is no cardiospasm. The author believes that achalasia of the cardiac sphincter accounts for every case of megaesophagus. He believes that the cause is organic disease of the ganglion cells of Auerbach's (myenteric) plexus.

The weight of the column of food is the major factor in the passage of material into the stomach and if it gets to a certain point, generally about 7 in., or the individual lies down, the pressure becomes insufficient and the flow ceases. The rest is retained and regurgitation rarely occurs as the pharyngoesophageal structure remains closed except during swallowing.

Jackson believes that the obstruction is a result of spasm of the muscle bundles of the diaphragm which encircle the esophagus at the hiatus, but it has been shown in dogs that bilateral phrenicectomy is ineffective and also that the dilatation sometimes extends past the diaphragm.

He disagrees with Mosher who felt that the obstruction was due to some abnormal position of the esophageal groove in the liver, especially when subjected to pressure from the left by excess of gas in the stomach. However, this is one condition in which there is never a gas bubble in the stomach.

Treatment of achalasia. The author uses mercury bougies and the largest bougie the patient can pass himself is chosen. It is kept in the esophagus for fifteen minutes on each occasion, just before each meal for two weeks, then gradually its use is decreased in frequency. In cases of esophagitis the diet will have to be liquid for a short time.

The attempt to relieve achalasia of the cardia by division of its sympathetic nerve supply by resection of the left gastric artery proved unsuccessful. Spinal anesthesia has been used with some success by Tel-

ford. Sometimes manual dilatation of the sphincter is done, but this is often unnecessary.

LEROY J. KLEINSASSER, M.D.

Hill, H. N., and Vinson, P. P.: The Incidence of Dysphagia from Intrathoracic Extraesophageal Tumors. *Pennsylvania M. J.*, 1943, 46: 814.

The authors have made a study of various conditions within the mediastinum which produce dyspnea and dysphagia. The esophagus, a soft muscular organ, is not readily displaced and thus, unless surrounded by a tumor or other lesion, its function is not apt to be interfered with. On the other hand, the trachea and primary bronchi are much less elastic and are much more easily effected by pressure.

Of the 50 patients studied, 33 had aneurysms of the large vessels in the superior mediastinum. Five of the remaining 17 had sarcoma; 4, an undetermined tumor; 2, cysts; 2, a thyroid tumor; 2, neurofibroma; 1, a teratoma, and 1, a dermoid. Evidence of pressure on the esophagus was demonstrated in 11 of the 50 cases, with dysphagia in only 4, whereas in 32 cases there was pressure on the air passages with evidence of dyspnea in 31.

In 3 of the 4 patients complaining of dysphagia it was due to aneurysm of the aorta and in 1 it was due to a lymphosarcoma of the neck. Dysphagia was the outstanding symptom in only 1 of these cases. The conclusion was that because of the fact that the esophagus is an elastic mobile tube dysphagia is seldom produced by extrinsic pressure.

WILLIAM E. ADAMS, M.D.

Kidd, H. A.: Excision of the Esophagus for Malignant Growth by the Abdominocervical Route. *Brit. J. Surg.*, 1943, 30: 340.

The author reports 2 cases of carcinoma of the lower third of the esophagus treated by esophagectomy by the abdominocervical route.

The case histories and operative procedures are described in detail. The abdominocervical route has the advantages of permitting resection of the lymphatic drainage area along the lesser curvature of the stomach and of producing less shock than the transthoracic approach, and it is followed by fewer complications. If the growth is found to be inoperable, the planned operation may be abandoned and a gastrostomy made. EDWARD W. GIBBS, M.D.

Greenfield, I., Steinberg, I., and Touroff, A.S.W.: "Spring Water" Cyst of the Mediastinum. *J. Thorac. Surg.*, 1943, 12: 495.

Thin-walled, fluid-containing cysts of the mediastinum have been designated variously as cystic hygromas, cystic lymphangiomas, and ciliated epithelial cysts. A rare form of lesion, of similar nature, is the so-called "spring water" cyst, first described by Churchill. The author presents the second case of this kind to be reported.

A forty-four-year-old white woman had a sensation of solid food being "held up for a short time in the upper substernal region." There was no discomfort on swallowing liquids. Her appetite remained good. Fluoroscopic examination revealed a homogeneous mass with sharply demarcated borders in the superior mediastinum. Roentgenograms established the location in the anterior mediastinum. Angiocardiography established the extracardiac origin of the mass. The tumor was removed through the left chest. The patient made a satisfactory recovery.

The tumor contained crystal-clear fluid of water consistency. The cyst wall was tissue paper thin for the most part. In other portions, ramifying blood vessels were noted upon the wall, and at several points, small amounts of fatty tissue were attached. The inner surface of the cyst was smooth. The pathological diagnosis was "mediastinal cyst lined by columnar-cell epithelium."

EARL O. LATIMER, M.D.

MISCELLANEOUS

King, E. S. J.: Some Experiences in the Treatment of Foreign Bodies in the Chest. *Austral. N. Zealand J. Surg.*, 1943, 12: 249.

One of the most important problems of war surgery has to deal with foreign bodies in the tissues. The questions of whether and at what time these should be removed are sometimes debatable because of the hazard of removal as well as the likelihood of complications if the object is not removed. The present article deals with the experience of the author in 12 consecutive cases of foreign body of the chest, to which another 10 were added after the article had been in press.

Only 1 death occurred among the first 12 operations. The patients were young adults in good condition prior to the casualty. The foreign bodies included shell casing in 6, bomb fragments in 3, and bullets in 3. These foreign bodies were located in the lung in 8 cases, the right upper lobe being involved in 3, the right lower in 2, the left upper lobe in 2, and the left lower in 1. Two of the foreign bodies were found in the pleural cavity, and the remaining 2 were in the mediastinum.

The clinical picture presented was divided into four groups: namely, (1) chest-wall wounds, (2) chest-wall wounds with hemothorax or pneumothorax, or both, (3) "sucking" chest wall wounds, and (4) chest wounds complicated by nonthoracic injuries.

The first group were the least difficult to manage, the operative interference being only the routine toilet of the superficial wound. In the second group the essential treatment was to minimize the sudden alteration in vital capacity and intrathoracic pressures. It was thought best to delay attempts at removing the foreign body until the acute stage had passed. The cases in the third group require immediate closure of the "sucking" wound, preferably with sutures. When this is done, these patients fall into the second group. The fourth group of cases may require more therapy for the wounds in the other parts of the body than the first group, the function of the chest organs being checked from time

to time for evidence of alteration and treatment when present.

Results of foreign bodies in the chest. In some cases very little evidence remains to show that a foreign body has passed through the lung or other structures. In some patients, pieces of splintered rib produce changes aside from those due to the passage of the foreign body *per se*, such as hemorrhage and traumatic pneumonitis. These findings may take several weeks to disappear. In a third group of cases, actual abscesses may develop—this having been the case in 4 of the 10 with a pulmonary foreign body in which operation was performed. In the pleura, areas of organized blood clot and empyema may be developed. However, empyema is uncommon. It was not encountered in any of the author's cases, although "through-and-through" wounds occurred twice.

In order to localize definitely a foreign body of the chest, roentgenograms should be made in more than one plane, and the chest studies should be made under fluoroscopic examination to determine evidence of movement.

Treatment. The early treatment of most importance is the resuscitation and maintenance of the revival of the patient, and the treatment of the complications which in themselves threaten life. There should be minimum interference with the return of the patient to some place where more adequate treatment can be obtained. Late treatment includes removal of the foreign bodies and the treatment of complications. This should not be undertaken if the patient is to be moved within a two-week period. The average time for convalescence following these procedures was just over five weeks. The size of the foreign body should not determine the decision for its removal, since abscesses may more frequently complicate the smaller foreign bodies.

The operative approach should be over the shortest possible route. Sufficient preoperative sedation and, in appropriate cases, artificial pneumothorax should be used. Following operation, sedation and intravenous and oxygen therapy, along with drainage of the pleural cavity, are of paramount importance.

Complications following operation may include wound infection, empyema, penumonia, and infection of the costal cartilages.

In 5 of the 10 additional cases added to the first 12, the shell or bomb fragments were located in the left lower lobe, in 2 they were in the right upper lobe, and in 1 case each they were in the left upper and right upper lobes. In the remainder they were in the posterior mediastinum. None of the 10 cases have ended fatally. WILLIAM E. ADAMS, M.D.

Drinker, C. K., and Warren, M. F.: The Genesis and Resolution of Pulmonary Transudates and Exudates. *J. Am. M. Ass.*, 1943, 122: 269.

While pulmonary edema is a very frequent and an easily diagnosed clinical condition, the mechanism of formation of pulmonary transudates and exudates is not yet clearly understood. In this article the authors, after reviewing a few points about the anatomy and physiology of the lungs, discuss the physiopathological aspect of this problem.

The lungs have the ability of meeting sudden strains so that a young adult can readily increase his pulmonary ventilation from a resting minute volume of 8 liters to 125 liters during exercise and with this change his cardiac output may rise from five to twenty liters. In spite of this adaptability the pulmonary circulation represents a vulnerable link in efficiency of the general circulation. Any change of the cardiac output has a repercussion on the lungs which possess a blood capacity, in terms of instant cardiac output, equal to that of the entire body. Under normal conditions the pressure in the pulmonary capillaries is low, from 5 to 10 mm. of mercury, instead of 20 mm. for the typical systemic capillaries. However, the colloid osmotic pressure of the blood going through the lungs is normal and much higher than the capillary blood pressure. This arrangement found in the lungs makes possible the dryness normally present in the alveoli. The profuse supply of lymphatic vessels in the lungs plays an important role in draining the excessive interstitial fluid of the pulmonary tissue.

The authors studied experimentally the formation and treatment of pulmonary transudates through the changes of the lymphatic circulation. In the dog the right lymphatic duct may be cannulated and its output in the absence of chyle represents practically the total lung delivery at the moment. If the respiration of the animal is made difficult by cotton-wool resistance, the intrathoracic negative pressure and the flow of lymph increase while the lymph itself becomes bloody. In cardiac decompensation both the increased pressure in the capillaries of the lungs and the anoxia which alters the permeability of the capillary wall are the causative elements of pulmonary edema. When oxygen lack causes the pulmonary capillaries to begin the leak, the increased fluid in the lung tissue, and even more in the alveoli, cuts down the easy passage of oxygen into the blood capillaries. It is the opinion of the authors that the patients' need for oxygen is usually appreciated only when too much time has passed. Treatments should start before the leakage from the pulmonary vessels is pronounced, otherwise it will be difficult to check the cycle that has begun.

If irritation by chemicals, viruses, or bacteria causes exudation from the pulmonary capillaries, then the results for the patient are usually worse than when transudation occurs. The fluid or coagulated exudate blocks the entrance of air into the alveoli and is removed very slowly through the vascular or lymphatic channels. The lymph system carries away from the tissues substances which are not absorbable from the blood capillaries. It is a fact that blood continues to pass through the lungs when the pulmonary capillaries are caused to leak freely and even when extensive pathological changes have taken place in the lungs. The essential therapy in

these patients consists of the early administration of pure oxygen. Considering the fact that there is no efficient way of getting oxygen into the body except through the lungs, if the barrier between the alveoli and the blood has become abnormal the pressure of oxygen in the lung air must be proportionally increased. CONRAD L. PIRANI, M.D.

Adams, W. E., Thornton, T. F., Jr., Carlson, A. J., and Livingstone, H. M.: Anoxia and Anesthesia in Intrathoracic Operations. *Surgery*, 1943, 13: 859.

An investigation of the incidence of anoxia both during and following intrathoracic operations was made in 45 patients (51 operations). The operations were made for carcinoma of the lung (9), mediastinal tumors or cysts (3), malignant hypertension (8), constrictive pericarditis (2), bronchiectasis (10), carcinoma of the esophagus or the stomach (12), and patent ductus arteriosis (1). Ethylene-oxygen, or ethylene-oxygen plus ether anesthesia administered under mild positive pressure (from 4 to 8 mm. of mercury) through a snug-fitting face mask was employed in most cases. Arterial blood studies were made before operation, at the end of the operation before the pleural cavity was closed, and following operation (from two to ten days after operation). These included the red-cell count, and the hemoglobin, hematocrit, and oxygen content.

Anoxia was seldom observed during the operation in patients who had no infection of the lung. Factors which played a major part in influencing the development of anoxia included:

The general condition of the patient, the state of the blood, the local disease, bronchial obstruction, and decreased vital capacity. The duration of the operation and the anesthesia appeared to have little influence on the production of anoxia when these contributory factors were controlled. Ether when added to ethylene-oxygen produced deeper anesthesia with associated adequate oxygenation. The administration of a high percentage of oxygen in an anesthetic mixture may give a false sense of security if sufficient attention is not given to the other factors which are known to play a part in the production of anoxia.

Among 51 operations the blood oxygen level before, during, and following surgery remained normal in 21, but was reduced during operation in 14. Postoperative reduction in the blood oxygen with unchanged blood oxygenation during surgery was observed in 12 of 44 patients (27.2 per cent) in whom postoperative studies were made. The hematocrit reading was a much better index than the red-cell count or hemoglobin value for the determination of the true state regarding the oxygen transporting media.

There were 6 postoperative deaths, none apparently related to the anesthesia employed. Three deaths were on the basis of cardiac failure, 1 was due to anuria following the use of sulfanilamide, another was due to pneumonia following lobectomy on a child with bilateral bronchiectasis who was a very poor risk, and the last was due to massive empyema with a leak of the anastomosis following resection of the cardia.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Jens, J.: Strangulated Femoral Hernia. A Review of 100 Cases. *Lancet*, Lond., 1943, 244: 705.

The author reviews 100 of a series of 115 cases of strangulated femoral hernia treated in one institution during a period of five years. A depressing feature of these cases was the variety of diagnoses that accompanied them to the hospital, almost any condition capable of causing abdominal pain having been suggested rather than the correct diagnosis.

The average age of the patients was 63.3 years, with the age limits being thirty-five and ninety-six years. Two-thirds of the patients were more than sixty years of age. Three-fourths of the patients were women, and, with 1 exception, all patients under the age of fifty were women.

Forty-two per cent of the patients gave no history of a previously existing hernia, the symptoms and signs of strangulation beginning synchronously with the appearance of a lump. Some strangulations were preceded by some definite action which would most likely increase the intraabdominal pressure, such as violent coughing. The condition often began with a sudden increase in the size of the hernia, or incarceration of a reducible mass.

Strangulation was characteristically ushered in by pain and vomiting, pain being present at the onset in 97 per cent of the cases. The duration of the pain was from three hours to fourteen days before operation, with an average period of two and six-tenths days. Cases requiring some further operation on the bowel, not necessarily amounting to resection, had a history of strangulation averaging four and three-tenths days, the longest period being fourteen days and the shortest ten hours. Two of 3 cases without pain were found to have nonviable bowel.

The symptom of pain was referable to 2 anatomical sites: the abdomen and the site of the hernia. The abdominal pain was in one of three locations: (a) in the middle of the abdomen (65 per cent), in which cases the sac always contained the omentum, small bowel, or the two combined; (b) in the epigastrium, a continuous gnawing type (4 per cent), probably due to a pull high on the mesenteric root; and (c) in the lower abdomen, of colicky type (7 per cent); in 5 cases the sac contained omentum, and in 2 the large bowel was in the sac. Pain at the site of the hernia was present in only 26 cases, and in 19 of these there was no associated abdominal pain. Vomiting was present in 84 per cent of the cases and its onset followed the onset of pain. In only 1 of the 16 cases without vomiting was there a bowel lesion of note. Tenderness over the sac was absent in 21 cases, and it is noteworthy that the absence of tenderness may be a danger signal rather than a reason for complaisance. There were 7 cases of Richter's hernia.

Three types of anesthesia were used: local, general, and spinal. Spinal anesthesia was considered impractical in many of the patients because of the severity of their general condition.

The sac content was as follows: small bowel only, in 63 cases; small bowel and omentum, in 23; omentum only, in 8; appendix, in 3; large bowel, in 2; and empty sac, in 1. The over-all mortality rate was 14 per cent.

Small-bowel strangulation was present in 86 per cent of the cases, with 20 cases of gangrenous bowel and 12 cases requiring resection. The mortality rate was 66 per cent. In 2 cases exteriorizing procedures were done; both patients died. Of the remaining 66 patients with small-bowel involvement without gangrene, 4 died. EARL O. LATIMER, M.D.

GASTROINTESTINAL TRACT

Joseph, E. G.: New Treatment for Acute Dilatation of the Stomach. *Am. J. Surg.*, 1943, 60: 381.

The prevailing opinion is that acute postoperative dilatation of the stomach generally follows upper abdominal surgery, and is very amenable to treatment. Such, however, is not the case. Acute dilatation of the stomach may follow almost any type of operation in any part of the body. All methods of treatment hitherto advocated may be unsuccessful, and attention is called to the following:

1. The generally accepted method of treatment, namely gastric lavage, may be completely ineffective.

2. Jejunostomy has been advocated for the relief of this dangerous condition.

3. Postoperative acute dilatation of the stomach is a dangerous complication and may result in the death of the patient.

Clinical observation of patients, extending over a period of years, has convinced the author that the surgical complication of acute dilatation of the stomach probably was not caused by ether or spinal anesthesia, by any specific operation, or by operation on any specific part of the body, and that all the patients who developed acute dilatation of the stomach had only one common factor, namely, the enforced confinement to bed following the operative procedure. It seemed to make no difference whether these patients had been kept in a horizontal position or had been propped up in bed. The one common and determining factor was the enforced confinement to bed.

It seemed logical, therefore, to reverse this state of affairs, and to force these patients to stand upright, and to aid them in taking a few steps. It was fully realized that a heroic method of treatment of seriously ill and debilitated patients was being proposed. However, it seemed justified in an effort to save life.

On paper the procedure sounds simple. In practice, however, it is not an easy task. The patient is on the verge of exhaustion from his long continued vomiting. He generally can hardly lift a limb or move his head, and is completely helpless. It requires, therefore, the aid of three strong men to lift the patient gently from his bed, to hold him upright on the floor, and to aid him in taking a few steps.

The results, once the patient is placed in the erect position, are extremely startling. The patient will experience a gurgling sensation in the throat and will belch. He will generally ask for a drink, and will be at once able to swallow half a cupful of water without nausea. After being supported in the erect position for ten minutes and after being aided in taking a few steps, he is gently laid down on his bed. In two or three hours the treatment is repeated, if necessary. After this, the vomiting usually stops and the patient begins to feel much more comfortable. STEPHEN A. ZIEMAN, M.D.

Kirklin, B. R.: Mistakes and Misunderstandings in the Roentgenological Diagnosis of Gastric Cancer. *Arch. Surg.*, 1943, 46: 861.

Lest anyone misapprehend the purpose of this article, let it be said at the outset that what follows is not designed to be a defense of the roentgenological method of diagnosis of gastric cancer or an apology for its shortcomings. Neither is needed, for the general efficiency and reliability of roentgenological examination in disclosing and identifying cancer of the stomach cannot be impugned, and it is safe to say that no practitioner of modern medicine would consider any diagnosis or exclusion of cancer to be complete and convincing without the roentgenological opinion. Yet there are true errors, such as failure to discover lesions or to predict their true character, and apparent errors which in fact are only misunderstandings as to the implications of certain roentgenological reports. Although the proportion of these actual and seeming lapses is not large, they are sometimes made the basis of expressed or implied criticism that, from the viewpoint of the roentgenologist, does not appear to be fair or constructive. From one point of view such criticism might be regarded as complimentary in that it may imply expectation of perfection in the roentgenological diagnosis of cancer; but the roentgenologist does not lay any claim to infallibility and he is more than willing to point out his mistakes, whether proved or imagined, in the hope of promoting a frank and clear understanding with his clinical and surgical colleagues.

One variety of error that is utterly indefensible is failure to discover an existing gastric cancer, whatever its size, situation, or morphological characteristics. Roentgenological examination will exhibit any gastric lesion that is capable of producing symptoms or that can be seen macroscopically, and failure to discern it should be charged to the examiner, not to the method. More common are the failures, mistakes, and misunderstandings in the roentgenological differential diagnosis of cancer from benign affections, but the aggregate of incomplete and wrong diagnoses is small in comparison with the number of misunderstandings by clinicians and surgeons as to the reservations implicit in certain roentgenological diagnoses and reports. Most of these misunderstandings arise from diagnoses of benign tumors of the stomach and gastric ulcer, and reports as to the operability of gastric cancers.

It is noteworthy that the roentgenologist rather seldom diagnoses benign lesions as malignant or resectable cancers as inoperable, and complaints on this score are rare. Thus, the predominance of mistakes in the opposite direction may seem to indicate that he is prejudiced in favor of the benignancy of gastric diseases and the resectability of cancer. As a matter of fact his prejudices, if he entertains any at all, would swerve him the other way, for he knows that most gastric lesions are malignant and most cancers inoperable. Perhaps the chief reason for his failures—and successes—is his strict adherence to the diagnostic codes and differential criteria that hard experience has taught him. If that is true he will probably continue to make mistakes, or be accused of them, until he learns more about his art or until his clinical and surgical associates learn more about it.

Stout, A. P.: The Pathology of Carcinoma of the Stomach. *Arch. Surg.*, 1943, 46: 807.

The material on which this article is based consists of 225 resected gastric carcinomas and 185 autopsies. Forty-two of these autopsies were made on persons whose stomachs had previously been resected. It is not known just what anatomical and physicochemical changes take place in the stomach preceding the development of cancer, but a few facts are certain. The relationship of cancer to chronic peptic ulcer is still much debated. The writer believes that cancer forms in the margin of a pre-existing chronic ulcer and that such tumors differ from ulcerated cancers. In a five-year period 13.4 per cent of the resected gastric cancers had developed at the margins of pre-existing ulcers. Possibly a still larger percentage of cancers are preceded by ulcers, since in advanced stages it is no longer possible to recognize the peptic ulcer after it has become overgrown by cancer. Peptic ulcers sometimes occur in stomachs which have cancers in other parts; because of this, it can be regarded as certain that the same factors which lead to the development of peptic ulcers are at least not unfavorable to the development of gastric cancer.

In chronic gastritis, the important lesion is that produced by the disappearance of the chief and parietal cells of the gastric mucosa and their replacement with mucus cells. It should be emphasized that it is entirely unknown and unproved whether or not there is a sequential relationship between this chronic gastritis with its glandular changes, and gastric carcinoma.

The great majority of gastric carcinomas are derived from the mucus-secreting cells of the mucosa. The pyloric end of the stomach is most frequently

affected. More tumors arise on the superior half of the stomach than on the inferior half. No part of the stomach is exempt, and this includes the cardia and the fundus. When cancer grows from a focal point in the stomach wall, unknown factors operate to inhibit the growth in some directions and favor it in others; thus, some cancers project into the lumen, others penetrate through the gastric walls without projection, while in a third group the growth is chiefly along the wall paralleling the surface. Some cancers are associated with early ulceration; others may ulcerate as a late manifestation of the disease, and still others may never ulcerate. The formation of fibrous tissue is another variable which has an important effect on the appearance of the growth. In the linitis-plastica type of gastric carcinoma, fibrosis of the gastric wall is paramount, and the widely scattered cancer cells may be difficult to recognize. Frequently, when the cancer approaches or involves the pylorus, the lumen of the pyloric ring may be greatly narrowed. In the presence of cancer the gastric mucosa usually shows an inflammatory cell infiltration.

Cancer of the stomach may present itself as a fungating lesion, as a spreading type of growth, as an ulcerated bulky tumor mass, or as a spreading condition represented typically by linitis-plastica cancer or leather-bottle stomach. Approximately one-half of the gastric cancers removed in this series had grown in such a fashion that it was not possible to assign them with assurance to any of the aforementioned types. In general, these were late cancers.

Like other types of malignancy, gastric cancer spreads to other tissues by direct growth and by metastasis through the lymphatic system and blood vessels. The first method of spreading carries it into the duodenum, the esophagus, the gastrohepatic and gastrocolic omenta, the pancreas, diaphragm, the transverse colon, and the liver. The lymphatic spread reaches first the lymph nodes along the greater and lesser curvatures, and later the other nodes farther afield, while the blood stream carries the tumor cells first to the liver and then to many other parts of the body. A small number of gastric cancers remain localized to the stomach itself. A study of the records suggests that there are many patients with cancer of the stomach who might have been saved by earlier operation with a consequent lowering of operative mortality. JOHN W. NUZUM, M.D.

Nettleship, A.: Experimental Gastric Carcinoma. *Arch. Surg.*, 1943, 46: 793.

In this review of experimental gastric cancer, the author points out the peculiarities of the human gastric mucosa and compares them with those of other species of animals. The recognized precancerous conditions of the mucosa are described, and special consideration is given to the concept of the possible origin of gastric cancer from a chronically damaged mucosa. Consideration is given to the multiplicity of factors which may occasion such changes in the mucosa of the stomach, but no claim is made for causal connection. The possible points for experimental attack are discussed.

The stomach does not offer ideal conditions for the study of the formal genesis of carcinoma, the mechanism of its origin from normal cells. Experimental work should be directed at determining the many environmental factors which are thought to be involved in its causal genesis.

The belief is gaining acceptance that long time factors are involved in the production of human gastric cancer, and it is assumed that these time factors will have to be duplicated experimentally. It appears that there should be a better chance for producing gastric cancer experimentally with the environmental agents considered to be responsible in man if these agents are employed to simulate those conditions of the gastric mucosa most commonly found associated with human gastric cancer, i.e., polyp, chronic gastritis, and ulcer. Spontaneous achlorhydria and atrophic gastritis in monkeys are known. Gastric polyps have been produced in rats by dietary deficiency. Such plans lend hope for a closer grasp of the causation of human gastric cancer.

JOHN W. NUZUM, M.D.

Ravdin, I. S., Royster, H. P., Riegel, C., and Rhoads, J. E.: Surgical Care of Patients with Gastric Cancer Before and After Operation. *Arch. Surg.*, 1943, 46: 871.

During the past decade increasing importance has been placed on the preoperative preparation and the postoperative care of patients with carcinoma of the stomach. This has resulted in a steady decline in the mortality associated with radical gastric resection. Indeed so important have the nonoperative phases of management become that no surgeon associated with this type of surgery would consider operation without at least attempting to correct certain of the abnormalities which are met with in nearly every instance of gastric carcinoma.

An understanding of the pathological physiology of gastric cancer is essential in the therapy of this condition. Certain factors stand out prominently in the clinical picture of gastric cancer. Chief among these are: (1) a low level of gastric acid or complete anacidity, together with a lowered volume of secretion; (2) infection of the gastric contents; (3) dilatation of the stomach; (4) deficiency of the vitamin B complex; (5) upset of the fluid and electrolyte balance; and (6) protein deficit.

Almost without exception, carcinoma of the stomach is associated with a low level of gastric acid, or complete anacidity, together with a lowered volume of secretion. Usually as a result of this condition the stomach contents become foul, probably in large measure because of bacterial action on ingested food. Under normal conditions the concentration of gastric acid is sufficient to check the development of the common pathogenic organisms which may gain access to the stomach in food. The major component of gastric acid is free hydrochloric acid, which, together with the enzymes of the stomach, has an in-

hibiting and destructive action on bacteria. Naturally when this free hydrochloric acid is reduced in concentration, or is entirely absent, the bacterial growth in the stomach is unchecked.

Dilatation of the stomach is due to two factors: (1) the obstructing lesion, and (2) the existence of a subclinical or clinical deficiency of the vitamin B complex. The retrograde distention resulting from a slowly increasing obstruction is easily understood. It occurs in any hollow viscus proximal to an obstructing lesion. The atony of the gastric musculature is largely responsible for the dilatation associated with the deficiency of the vitamin B complex. This atony increases in degree with the increase in vitamin B deficiency. The nausea and anorexia which are frequently observed in gastric carcinoma are in part due to a deficiency of the vitamin B complex. Important diagnostic criteria are the enlargement of the gastric outline and the smooth gastric walls associated with vitamin B deficiency. When dilatation is present without vitamin B deficiency it is almost invariably possible for the fluoroscope to show evidence of increased peristaltic activity of the gastric wall. With decreased tonus and impairment of peristaltic activity a deficiency of the vitamin B complex is indicated.

The anorexia and nausea so frequently present in gastric carcinoma have a twofold result, (1) a restriction in total caloric intake and (2) an alteration in the composition of the ingested food. These two conditions bring about a reduction in the concentration of plasma protein. This in turn is followed by a subclinical or clinical nutritional edema.

Moderate or severe degrees of anemia are frequent in patients with gastric carcinoma. Usually the anemia is of the so-called iron-deficiency type, but in some instances it assumes many of the characteristics of primary pernicious anemia.

With a knowledge of these physiological abnormalities the therapy must be directed toward correcting, on the one hand, the infection, dilatation, and atony which affect the stomach, and on the other hand, the systemic changes which result from the nutritional deficits and the losses of fluid and electrolytes to which many of these patients are subject.

For the preparation of patients with gastric cancer for operation the authors advocate the following measures:

For several days before operation the stomach should be kept empty. This may be accomplished by periodic gastric lavage or by continuous suction drainage plus repeated lavage. It is best not to give any food by mouth for from two to five days after the institution of suction drainage and only when pyloric patency is established to permit the ingestion of readily digestible foods. The administration of small amounts of dilute hydrochloric acid during this period is helpful. The acid can be introduced into the stomach through the indwelling tube, which is then clamped for from one to two hours. The use of hydrochloric acid will lead to an earlier disappearance of the foulness of the gastric contents and to a more rapid reduction in the bacterial count. This local treatment leads to a considerable improvement in the state of the patient, a lessening of the epigastric distress and pain, and a disappearance of the nausea and vomiting. Frequently, too, there is evidence of improved gastric emptying.

Simultaneously with the cleansing of the stomach, deficiencies of the important vitamins should be compensated. From 10 to 20 mgm. of thiamine hydrochloride and 100 mgm. of ascorbic acid may be given subcutaneously each day. As soon as evidence is obtained of a functioning pylorus, 2 to 4 gm. of brewers' yeast should be given daily by mouth or through the stomach tube, the tube being clamped for two hours afterward. If this cannot be done for some time because the pylorus is not patent, a daily dose of 50 mgm. of nicotinic-acid amide may be given subcutaneously.

Vitamin K, while not specifically indicated for all patients, has frequently been useful for those whose gastric drainage is at times blood-tinged. In several of these patients mild to moderate degrees of hypoprothrombinemia have been found, and if this condition is present one of the soluble synthetic products with vitamin K activity should be given parenterally; 4 amino - 2 - methyl - 1 - naphtol hydrochloride (synkamin) in doses of 3 mgm. per day is generally satisfactory. While hypoprothrombinemia is often associated with hepatic metastases, it does not follow that all patients with hypoprothrombinemia have inoperable lesions.

Nearly all patients of this group who have been vomiting, and many others as well, become dehydrated. For several reasons, however, it may be unwise to attempt to replace the deficit too rapidly. The tolerance of each patient for fluid must be carefully watched, but it is unreasonable to assume that the intravenous route cannot be used if care is exercised. With the exception of patients with cardiac disease, it has been found practical to administer from 50 to 60 cc. of fluid per kilogram of body weight per day to dehydrated patients, over and above the amount lost by suction drainage. This is continued until the twenty-four-hour output of urine exceeds 1 000 cc. When the kidneys excrete this amount it is generally assumed that dehydration has been overcome and the fluid intake can be reduced to maintenance levels.

While the water balance is being corrected, the salt balance, the acid-base equilibrium, and the serum-protein concentration must be corrected.

Administration of water and sodium chloride increases the tendency to edema and may occlude an already narrowed pyloric canal in a patient without labile protein reserves. Patients who vomit repeatedly have a chloride deficiency. To correct this deficiency, 0.5 gm. of sodium chloride per kilogram of body weight should be allowed for each 100 mgm. per 100 cc. of reduction in the serum-chloride concentration. If a patient does not respond to this treatment, a 2 per cent sodium-chloride solution is given intravenously.

Should hyperchloremia inadvertently be produced, gastric lavage, with 200 cc. of water introduced into the stomach, may be done and the water then aspirated after twenty minutes. This may be repeated.

In extreme alkalosis 2 per cent ammonium-chloride solution may be given intravenously. Two cubic centimeters per kilogram of body weight of this solution depress the carbon dioxide about 3 per cent. This treatment has been used successfully and without serious reaction in patients in whom there was danger of nephrosis due to alkalosis.

If an anemia of considerable degree is present, multiple small transfusions of whole blood are in order. In case the anemia resembles primary pernicious anemia, parenteral administration of a suitable liver extract should be begun before operation. Subsequent to operation, when the new stoma is functioning, iron therapy should be instituted for those patients whose anemia is of the iron-deficiency type.

Of all the various disturbances of patients with gastric carcinoma, hypoproteinemia is possibly the most difficult to correct. The most rapid and most satisfactory corrective measure is by means of transfusion of plasma. Usually the injection of from 250 to 500 cc. per day will bring the serum-protein level up to normal. Protein digests fed into the stomach or duodenum are also of value once pyloric patency is established.

The postoperative treatment favored by the authors consists of jejunal feeding. For a number of their patients a preparation containing amino acids, polypeptides, and carbohydrates was employed in orojejunal feeding. Simple foods, however, such as skimmed milk and banana powder, have been used successfully. In the postoperative period the fluids must be scientifically injected into the veins. A careful study of the previous day's intake and output is the best guide in determining the amount of sodium chloride, of dextrose and water, and of plasma or serum or amino acids which each patient should receive. Moreover, repeated studies of the plasma chloride and protein, and, at times, even of the total base are necessary. When the orojejunal method is instituted the intravenous administration of fluids is rarely required, with the occasional exception of plasma or serum. The augmented intake of vitamins should by all means be maintained during postoperative treatment. MATHIAS J. SEIFERT, M.D.

Phemister, D. B.: Transthoracic Resection for Cancer of the Cardiac End of the Stomach. *Arch. Surg.*, 1943, 46: 915.

Cancer primarily in the cardiac end of the stomach and involving the esophagus, as well as cancer primarily in the lower esophagus and involving the cardia, are discussed in this article. Both tumors produce symptoms by obstructing the lower end of the esophagus. Both tumors involve, by direct extension, the immediate structures in this area, including the liver, diaphragm, and spleen. Metastases may involve the regional lymph nodes along the lesser curvature of the stomach or the liver. Carcinoma of the lower esophagus is the more likely of the two to metastasize to the lymph nodes in the posterior mediastinum.

A review of the literature, including meritorious operations, is given. These operations date back only to approximately 1933; they include resection of the lower esophagus and cardiac end of the stomach with anastomosis of the esophagus and stomach, or small intestine, following the resection.

A report by Churchill and Sweet presented the lowest mortality: in a group of 13 patients operated upon, there were only 3 deaths. Two of the 10 survivors died of reoccurrence at a later date.

The author's experience dealt with 10 patients. In 7 of these the location of the tumor was primarily in the gastric cardia and in 3, in the lower esophagus. There were 4 postoperative deaths. One patient died of auricular flutter and pneumonia on the fourth day, 2 succumbed to regional infection and leakage of the anastomosis on the seventh day, and the fourth made an immediate recovery, but six weeks later developed a small abscess at the site of the anastomosis, which was drained. His condition improved and he was discharged from the hospital, but was again admitted and expired three and a half months after operation from infection near the anastomosis.

Preoperative treatment. Some of the more pertinent factors in the operative management of this condition include the preparation of the patient for operation. The state of nutrition, which is usually impaired, should be improved by appropriate management. Blood transfusions are usually needed to overcome anemia. Sulfanilamide compounds were used in some of the author's cases.

Operation. Preliminary exploratory laparotomy or gastrostomy is rarely employed. Ethylene anesthesia administered under slightly positive pressure with a face machine is routine practice. A small amount of ether is sometimes added. Intravenous administration of saline solution is begun before the operation and blood is added during the course of the operation. The patient lies on his right side and the approach is through the eighth rib bed, after resection of that rib. After exploration of the tumor, the diaphragm is opened widely. The spleen, usually adherent to the stomach, should be removed. Mobilization of the stomach is facilitated by dividing the left gastric artery; the lymph nodes are mobilized along with the primary tumor. Soiling of the area is minimized by means of a tape which is tied about the esophagus above the tumor, also by intestinal clamps placed on the stomach. An end-to-side anastomosis is made by using two rows of interrupted linen sutures. The primary wound is closed after the insertion of a pezzar catheter drain through a stab wound in the chest wall. Postoperative care includes the use of an oxygen tent for several days and continuous suction drainage of the pleural space.

Shock did not occur in any of these cases, its absence being attributed to the replacement of blood lost during operation. WILLIAM E. ADAMS, M.D.

Farris, J. M., Ransom, H. K., and Coller, F. A.: Total Gastrectomy; Effects upon Nutrition and Hematopoiesis. *Surgery*, 1943, 13: 823.

Metabolic studies were made upon 24 patients who survived complete gastrectomy, in order to determine the essential roles of the stomach in man. The amount of protein which could be digested and absorbed from a given diet was calculated by the following formula: "Food nitrogen—(stool N—metabolic N) = Absorbed nitrogen." The coefficient of digestibility of the protein in a three-day diet was found to be 89.2 per cent, which is a normal figure for the protein contained in this diet. It appears that the stomach does not play an essential role in protein digestion, and that this function may adequately be taken over by the trypsin and erepsin in the small intestine. Total fat determinations were also made on the three-day diet. The amount of fat in the feces was found to be within normal range, and in 4 patients who were followed for several years there were no errors in fat metabolism.

Blood studies on 4 patients who have survived total gastrectomy longer than two years did not show macrocytic anemia. Many of the patients developed a hypochromic microcytic anemia associated with iron deficiency. Administration of hydrochloric acid with the diet, or ferrous iron, consistently produced improvement. The hemoglobin levels remained satisfactory as long as the patients took ferrous iron one week out of each month. Ferrous iron is the only form in which iron can be absorbed by the alimentary tract. Anemia can be prevented by the administration of ferrous iron or by conversion of ferric iron in the diet with hydrochloric acid.

Carbohydrate metabolism was studied by glucose tolerance curves. These were found to differ from normal curves in the following respect: the initial hyperglycemic phase was more pronounced and was followed by a rapid fall to hypoglycemic levels. This variation from normal is a result of an increase in the rate of absorption of glucose, since intravenous glucose tolerance tests gave normal curves. Rapid emptying of the stomach through large anastomoses may result in hyperglycemia followed by hyperinsulinism and hypoglycemia. High protein, low carbohydrate diets were effective in preventing postprandial abnormalities in blood-sugar levels.

Gastrectomy produces transient increased motility of the gastrointestinal tract, but in the patients followed up this was only of temporary significance and the end-result was a slight decrease in motility.

JOHN L. LINDQUIST, M.D.

Holman, C. W., and McSwain, B.: Gastric Acidity Following Gastric Resection. *Surgery*, 1943, 13: 916.

Gastric resection is becoming increasingly popular as a method of surgical treatment of peptic ulcer. There are two advantages which this procedure has over the more conservative operations such as pyloroplasty or gastrojejunostomy. These are (1) that the ulcer is removed, and (2) that gastric acidity may be lowered; hence the danger of the development of a secondary ulcer is reduced.

It is the purpose of the present report to summarize the findings on 88 patients subjected to gastric resection for peptic ulcer, and to emphasize certain technical features of the resection which make it a practical procedure and often produce a low postoperative acidity.

Many surgeons have found that high resection of the stomach is necessary to produce a postoperative anacidity. Such operations are not always feasible and make the subsequent anastomosis very difficult, and, except in experienced hands, the mortality is often high. With these features in mind, the authors have attempted to determine the type of resection that most often produces a low postoperative acidity, and which at the same time is relatively simple and safe.

Of the 88 patients subjected to surgery, 25 had peptic ulcers and 66, ulcers of the duodenum. The follow-up studies in gastric analyses were performed repeatedly over a period of from one to seven years after operation. However, only 25 per cent of the patients were followed up for more than five years. Personal interviews and careful analyses of the gastric contents were obtained in each case. In all cases listed as having a low acid or anacidity at least two determinations were made.

The types of resections performed may be divided into three groups: those in which the antrum was removed; those in which one-half to two-thirds of the stomach and a portion of the lesser curvature beyond the incisura angularis were removed; and those in which more than two-thirds of the stomach was removed. These authors observed that simple removal of the antrum failed to produce the postoperative anacidity, which confirmed the results of previous observers. It was found that gastric resection carried out proximal to the incisura angularis insured low postoperative acidity in a high percentage of patients. Furthermore, they observed that at the same time a large portion of the greater curvature could be left *in situ*, which made the resection technique easier. Moreover, with marginal ulcers developing in from 5 to 10 per cent of this group, the amount of the greater curvature of stomach remaining may prove beneficial to secondary procedures. Forty-six of the patients were subjected to this operation, and 80 per cent of these demonstrated a low acid postoperatively. In the last group of cases (11 patients) more than two-thirds of the stomach was removed, with the result that approximately 90 per cent demonstrated a low acidity.

As this result is only 10 per cent better than that obtained in the second group, and since the mortality of this more radical procedure, especially in less experienced hands, may be considerably greater, the authors do not recommend removal of two-thirds or more of the stomach for peptic ulcer.

J. GARROTT ALLEN, M.D.

Rhoads, J. E., Riegel, C., Koop, C. E., and Ravdin, I. S.: The Problem of Nutrition in Patients with Gastric Lesions Requiring Surgery. *West. J. Surg.*, 1943, 51: 229.

As advances in anesthesia, asepsis, the prevention of shock, and the management of fluid balance have been made, surgeons find with increasing frequency that the nutritional factors limit the success of their work. Perhaps in no field of surgery are these factors more important or more frequently encountered than in gastric surgery.

The outstanding nutritional deficits in these patients are of proteins and of certain of the vitamins, particularly those of the B complex and cevitamic acid. Shortage of carbohydrate, fat, and vitamins other than B and C are of less importance. The B vitamins as a group are apparently necessary to render gastrointestinal activity completely normal. Deficiency in vitamin C interferes with the healing of wounds, and is apparently concerned in the production of collagen.

The administration of adequate amounts of proteins, however, is a more difficult matter. Hypoproteinemia causes delayed gastric emptying time in the experimental animal. In a group of hypoproteinemic patients who had persistent vomiting after gastric operations, vomiting stopped and gastric emptying proceeded satisfactorily after the serum protein concentration had been restored by transfusions. Wound healing is greatly retarded by hypoproteinemia, and fibroplasia fails to occur normally in the hypoproteinemic animal. It has been demonstrated that this effect could be overcome by restoration of the plasma proteins.

The authors have employed five techniques for giving the patient protein without using the stomach. The first technique, which is simplest in theory and in practice, is plasma transfusion. The second is the intravenous administration of amino-acid solutions; the third, is the nutrient enema; the fourth, orojejunal feeding; and the fifth, gastrojejunal feeding as suggested by Bisgard.

Plasma transfusion is probably the most nearly ideal method qualitatively, but it is often impractical quantitatively.

The intravenous administration of amino-acid solutions is a method of great promise because theoretically it permits the use of nonantigenic protein-building materials which can be obtained from casein or from other abundant foreign protein. Reports of its successful use in patients, both in maintaining nitrogen equilibrium and in increasing the plasma protein concentration in hypoproteinemia, have been made. While intravenous amino-acid solutions are an important adjunct in protein nutrition, the preparations now available cannot be relied upon to supply the total nitrogen requirement of the patient, according to the authors' experience. Furthermore there is doubt as to whether this is an efficient method of building plasma protein, because Elman found that it required from 25 to 30 gm. of amino acids to produce 1 gm. of plasma protein.

In the period between 1890 and 1910 much work was done on rectal alimentation. Various recipes were devised and tried out empirically. However, it may be said, in general, that the solutions are prone to irritate the large bowel with resulting diarrhea, so that the method is unreliable.

The orojejunal method of feeding became possible with the development of the two-lumen tube, which made it practical to provide jejunal feedings for postoperative patients requiring simultaneous gastric suction. This is done by inserting an Abbott-Rawson tube through the nose before operation.

The gastrojejunal route utilizes the Abbott-Rawson tube also, and is a modification, suggested by Bisgard, of the orojejunal method. Its principal advantage is that it avoids the discomfort and irritation of an indwelling nasal tube and can be left in place longer. Utilizing this route, split protein preparations and also gastrostomy diets have been given. The formula used, which has met with greatest success, is that of 150 gm. of banana powder, 150 gm. of skimmed milk powder, and 150 gm. of cottage cheese in 1,500 cc. of skimmed milk.

Of the five methods outlined for the administration of protein to the hypoproteinemic patient, the authors have come to rely mainly on plasma transfusion for preoperative preparation and on either of the jejunal feeding methods for postoperative feeding.

JOHN E. KIRKPATRICK, M.D.

Logan, V. W., and Bransford, P. W.: Peptic Ulcer in the United States Navy. *Ann. Int. M.*, 1943, 18: 929.

Thirty-five years ago, the Surgeon General of the Navy listed in his annual report, under "gastric ulcer," but two admissions. Since that time there has been a steady rise in the incidence of peptic ulcers. The most recent statistics available (1940) show ulcer of the duodenum as being seventh among diseases of the digestive system on the sick list, and first in the number of sick days per case. Three hundred and five peptic ulcers are reported, 15 per cent of which were gastric ulcers; 20 per cent of those admitted with this disease in 1940 were invalided from the service.

British medical writers, likewise, have stressed the seriousness of the peptic-ulcer problem in the armed forces, and there is a remarkable similarity to our own problem in the statistical facts, digestive diseases accounting for about 15 per cent of all medical patients admitted to military hospitals.

Twenty-seven cases of peptic ulcers seen in 1942 at the Philadelphia Naval Hospital are reported and reviewed by the authors.

The disposition of ulcer patients in military medicine is a recognized medical problem. The British, early in the war, sent most of the men who responded to treatment back to duty; however, there were so many relapses that a ruling was issued which included the following causes for invaliding from service: (1) a long chronic history of ulcer indigestion with anemia, loss of weight, or tenderness (roentgen-

ray confirmation not obligatory); (2) active symptoms, with a lesion proved by roentgen rays; and (3) a history of perforation or massive hemorrhage.

In past years, only 20 per cent of those suffering from ulcer have been invalided from the United States Naval Service. In the light of the British experience, a policy for dealing with the ulcer problem in the Navy should be determined.

Greater efforts to discover and eliminate the man who has a peptic ulcer before his entry into the service is necessary. The authors advocate that the utmost caution must now be exercised in discharging these men even to limited duty. The best interests of both the patient and the naval service demand that no officer or enlisted man suffering from peptic ulcer should be discharged to duty without the recommendation of a board of medical survey, approved by the Bureau of Medicine and Surgery. Further, the Board of Medical Survey should recommend for return to duty only those ulcer patients who are definitely indispensable and whose case histories are most innocuous.

From the evidence at hand, the odds are that such patients will have a recurrence on active duty.

STEPHEN A. ZIEMAN, M.D.

Rook, A. F.: Peptic Ulcer. The Prognosis in Royal Air Force Patients. *Lancet*, Lond., 1943, 244: 733.

In civil life the majority of patients with peptic ulcer manage to carry on and comparatively few become chronic invalids. In contradistinction to this, it is generally agreed that peptic ulceration is a bar to service in all three branches of the armed forces, and most cases of proved ulceration have been invalided, only a minority of the patients returning to duty after a course of treatment.

The proportion of patients returning to duty is probably the largest in the Royal Air Force, (1) because the proportion of skilled technicians is high and every attempt is made to keep valuable men, and (2) because the chance of placing these men in sheltered appointments and even allowing them to live in their own homes is greater in the Royal Air Force than in the other services. It was believed that an inquiry into the history of patients with peptic ulceration after they had returned to duty might be valuable as a guide to future procedure.

The men of prime importance in the Royal Air Force are the pilots and the other members of the aircrew. Their training is long and expensive and their care and the maintenance of their physical efficiency is the first duty of the Royal Air Force medical service. The unskilled airman with symptoms of peptic ulceration is often better in civil life.

In the case of pilots with peptic ulcer, return to flying is gradual, and many months with complete freedom from symptoms must elapse before a full flying category can be regained. These patients tend to break down in hot climates, and a period of freedom from all symptoms, usually of about four years, has been insisted upon before they are passed for overseas service.

The medical records of over 1,300 cases, diagnosed as peptic ulceration and reported during the first eighteen months of the war, have been examined. From this large group, a very selective group of 194 officers and airmen was chosen for study relative to guidance in the disposal of patients with peptic ulceration. Only the better type of men with great certainty of positive diagnosis and frequently with some complicating symptoms of peptic ulcer are included in this group.

The fate, as regards service in the Royal Air Force, of 194 men with peptic ulceration who were allowed to return to duty has been followed for about two years. After this period, just two-thirds of the group were still serving and about one-third had been invalided. About half of those patients who were members of the aircrew returned to flying duties. In this group of cases, selected as being worthy of retention in the service, the subsequent history suggests that help in disposal may be obtained from the rank, for the higher the rank the more likely the patient is able to carry on.

Neither the length of history nor any of the various criteria of diagnosis appear to offer any guidance as to whether or not an airman, after treatment for peptic ulceration, is likely to withstand Service life.

JOHN W. NUZUM, M.D.

Knaus, H.: A Rare Complication (Ileitis Terminalis Tuberculosa) in the Puerperium and Its Cure (Eine seltene Komplikation [Ileitis Terminalis Tuberculosa] im Wochenbett und deren Heilung). *Zbl. Gyn.*, 1943, 66: 66.

A twenty-two-year-old girl consulted the author on account of too frequent menstruation and dysmenorrhea. Her mother and one aunt had tuberculosis. The patient had had her appendix removed at the age of six years. For five years prior to admission she had been suffering at intervals from epigastric discomfort and painless diarrhea.

Two days after delivery sharp pains occurred in the right lower quadrant of the abdomen and the temperature rose to 99.8 degrees, but returned to normal levels the following day. Twelve days after delivery the temperature rose again and a cylindrical tumor, of the size of a thumb, became palpable in the appendix region. Relatively normal pulse, absence of any signs of peritoneal irritation, and also normal lochia excluded the diagnosis of a puerperal tumor of the adnexa. X-ray studies of the intestinal tract three months after delivery revealed a condition of irritation of the cecum, and of the ascending and transverse colon. The patient was losing weight, vomited repeatedly, had a subfebrile temperature, and foamy, thin, malodorus stools. The vaginal examination showed a movable tumor of a firm consistency to the right of the uterus. A diagnosis of a tubal or tubo-ovarian tumor was made.

The laparotomy showed normal internal genital organs; a segment of the terminal ileum 25 cm. in length was transformed into a firm tube with thick walls. There were a few small glands in the corre-

ponding portion of the mesentery and a slight peritoneal exudate. The involved portion of the ileum was resected and an end-to-side ileocolostomy was performed.

The histological examination disclosed typical tubercles formed by epitheloid cells in the mucosa and the muscular layer. Nonspecific changes were found in the lymph glands. The histological diagnosis was hyperplastic, ulcerative tuberculous ileitis.

The patient recovered completely from her ailment, gained in weight, had normal defecation, and no subjective complaints for several months.

A new period of diarrhea, probably caused by nonobservance of dietary rules, was promptly relieved by diet and medication. Two and one-half years after the operation the patient was well.

The author calls attention to the fact that, contrary to nonspecific terminal ileitis, the tumor was movable in this case. JOSEPH K. NARAT, M.D.

Baker, J. W., and Carlile, T.: Solitary Diverticulitis of the Cecum. *J. Am. M. Ass.*, 1943, 122: 354.

The authors report 2 cases of solitary diverticulitis of the cecum with surgical findings, as well as 37 cases found in the literature. The differential diagnosis of solitary diverticulitis of the cecum is almost impossible preoperatively. In the majority of the cases in this series a preoperative diagnosis of appendicitis was made. In 29, it was discovered that the appendix was normal or not primarily involved. In 14, resection of the cecum and/or of the ascending colon was considered advisable, either because of the extent of the lesion or because it was thought to be malignant or tuberculous.

The differential diagnosis is considered, but no positive preoperative diagnostic criteria were found. The outlook in these cases is favorable for complete recovery. HAROLD C. OCHSNER, M.D.

Stevens, N. C.: The Value of Auscultation of the Abdomen in the Diagnosis of Acute Appendicitis. *Am. J. Surg.*, 1943, 60: 365.

The peristaltic rate in a healthy young adult varies from five to ten tinkles a minute. The sounds are usually high pitched and faint in character and are influenced in rate and quality by certain organic conditions of which acute appendicitis is one.

The author emphasizes the importance of abdominal auscultation when one is confronted by a patient suspected of having acute appendicitis. To be of real value, auscultation should be done at intervals over a period of from one-half to three-quarters of an hour. At the beginning of an attack the rate is usually increased, but as the inflammatory process progresses peristalsis becomes diminished. With irritation or infection of the peritoneum, peristalsis ceases.

A combination of increasing pain in the right lower quadrant of the abdomen and decreasing peristalsis in any suspected case of appendicitis should be considered as a strong diagnostic syndrome.

EDWARD W. GIBBS, M.D.

Capurro, R.: Hyperesthesia of the Posterior Peritoneum in Appendicitis and Other Visceral Lesions. *Ann. Surg.*, 1943, 117: 735.

The author describes a new test for appendicitis which was used clinically in 200 cases. In the first 53 cases, all but 1 gave a positive iliacus test. These cases included chronic recurrent and acute appendicitis with a weak peritoneal reaction.

The iliacus test consists of deep palpation of the area just internal to and above the crest of the anterior iliac spine. It is performed with the index finger placed anteriorly on this region, and, assisted by the thumb, a compression of the area is made. The objective painful response is completely independent of the position of the appendix.

In order to determine the location of the seat of the pain, 3 cases of acute appendicitis were operated upon under local anesthesia. After the parietal peritoneum was carefully freed from the anterior surface of the iliacus muscle, it was found that digital pressure on the muscle induced no painful response; but upon compression of the peritoneum between the two fingers, one extraperitoneal and the other intraperitoneal, a painful reaction was provoked. This was eliminated by novocain infiltration of the mesoappendix.

These results agree with the accepted explanation of objective painful reflex responses, in that the visceral peritoneum receives its innervation from the thoracolumbar sympathetic and the craniosacral parasympathetic systems; on the other hand, the parietal peritoneum is innervated by the spinal nerves. Since the visceral afferent nerves convey painful sensations in appendicitis to the 11th and 12th thoracic segments, which are those involved in the innervation of the parietal peritoneum covering the iliacus muscle, the injection of novocain into the mesoappendix eliminates the reflex at its source.

In the case showing the exception, there was either an overflow of novocain surrounding the parietal peritoneum, or an abnormally retracted peritoneum, which was found at operation.

In the examination of other visceral lesions it was found that the zone of objective pain was not the same. In salpingo-oophoritis the zone of hyperesthesia was found to be on the body of the first sacral vertebra near the sacral wing, right or left, according to the site of the lesion. This same zone of hyperesthesia was found in epididymitis, and the reflex pain disappeared after novocain infiltration of the scrotal cord.

After a few observations on the areas of hyperesthesia in lesions of the stomach, duodenum, and gall bladder, they were found to be on the bodies of the lumbar vertebra at the level of the umbilicus. In kidney lesions the zone appears to be on the iliac crest at the anterior axillary line, and is lateral to the ureter.

Like all pathognomonic tests for appendicitis, the squeezing of the iliacus muscle with the lateral fold of the parietal peritoneum between the thumb and finger is an additional valuable sign of acute appen-

dicitis. Experience with the test is far from complete as the hyperesthetic zone may be present in different conditions not requiring surgical intervention.

JOHN E. KIRKPATRICK, M.D.

Skinner, H. L., and Duncan, R. D.: Treatment and Analysis of 350 Consecutive Cases of Acute Appendicitis. *Virginia M. Month.*, 1943, 70: 297.

In this review of 350 consecutive cases of acute appendicitis the authors include all cases that showed definite pathological changes in the appendix and a few which showed multiple fecaliths or constrictions accompanied by little or no pathological change.

The average duration of symptoms in the nonruptured group was 2.66 days and in the ruptured group was 3.80 days. The importance of persistent localized tenderness is again emphasized. Tenderness was marked in 37.0 per cent of the cases, moderate in 39.4 per cent, slight in 2.5 per cent, and absent in 1.1 per cent. Rigidity was marked in 18.0 per cent, slight in 48.9 per cent, and absent in 33.1 per cent.

Immediate appendectomy was done in 95.8 per cent of the cases. However, delayed treatment was carried out frequently when the acute symptoms had been present for three days or more. There were 17 cases of appendical abscess. All were treated by delayed operation. In 6 the appendix was removed with drainage. In 11 drainage was instituted without appendectomy.

There were 5 deaths in the entire group, a mortality of 1.4 per cent. All deaths occurred in the group of 31 cases with perforation of the appendix. The mortality for this group alone amounted to 16.1 per cent.

Five patients had recurrent acute appendicitis following simple drainage and in each case the patient had failed to return within the six or eight weeks for secondary appendectomy.

EDWARD W. GIBBS, M.D.

Slocumb, L. H.: Pruritus Ani. A Study of Mucosal pH and Bacterial Flora. Treatment Based upon These Findings. One Hundred and Five Case Reports. *Am. J. Digest. Dis.*, 1943, 10: 227.

Local measures aimed at correcting mucosal redundancy and separation, almost constant findings in cases of pruritus ani, are discussed. A sclerosing agent (5 per cent phenol in oil) is injected between the mucosa and submucosa. The entire area is infiltrated, often as high as 3½ in. above the linea pectinate. The injections are made at weekly intervals, usually three, each time. The amount of solution used depends upon the degree of mucosal separation. This procedure accomplishes the same purpose as the Hanes hydrochloric-acid technique for mucosal prolapse, but it is entirely an office affair and in no instance have complications caused trouble.

Scrupulous care of the outside area is of the utmost importance. Cleansing with toilet paper is one of the main sources of traumatism. Following evacuation, the parts are carefully cleansed with castile soap and water, the hand being used for the purpose, and not cloth or cotton. Thorough rinsing with clear water is followed by the application of a saturated boric-acid solution. The parts are patted dry and tincture mercresin or a like solution is painted over the itching area. Several times during the day, sponging with boric-acid solution removes secretions that may have accumulated. A boric-acid pack at night often gives complete relief and prevents scratching during sleep. Occasionally, mild ointments or lotions are resorted to, but usually this is unnecessary.

There is evidence that the pathological findings which accompany pruritus ani are caused by a chemical irritant, alkaline in reaction and probably metabolic in origin. There is also evidence that there is a correlation between the mucosal pH and bacterial flora; alkalinity favors the growth of Gram-negative bacteria, and acidity favors the growth of Gram-positive organisms.

One hundred and five case reports of pruritus ani were presented and results in terms of improvement, pathologically and symptomatically, were in most instances striking.

Treatment has been directed toward correcting the high alkaline pH in the rectum and colon, and, also, toward reducing mucosal prolapse and redundancy, which mechanically interfere with the free circulation of both the blood and lymph in the region.

A strict dietary regimen is most important. Those foods which tend to produce lactic acid are pushed to the limit and later regulated according to the pH changes. They include milk, buttermilk, acidophilus milk, lactic whey, cottage cheese, other cheeses, yoghurt, beta-lactose, and other carbohydrates. Those foods which produce alkalinity and putrefactive processes are eliminated from the diet as much as possible. They include meat, leafy vegetables, citrous fruits, and other foods of the kind. Hydrochloric acid, before and after meals, seems of benefit in cases in which bowel evacuations are too frequent and in which the bowel contents are soft, sticky, and acholic in appearance.

A local measure for reducing the alkalinity and cleansing the ampulla is the administration of a lactic-acid solution containing papain, which is a mucous dissolvent. One or two ounces of a 2½ per cent lactic-acid solution, added to a pint or quart of warm water, is used daily at bedtime as a rectal douche. Lactic acid is more efficient than either hydrochloric acid or boric acid in maintaining a pH of between 6.5 and 7.5, and also in promoting the growth of Gram-positive bacteria.

It seems probable that metabolic processes which have to do with the production of lactic acid play a most important role in maintaining normal colon physiology, and that research along these lines may solve the pruritus-ani problem.

CHARLES BARON, M.D.

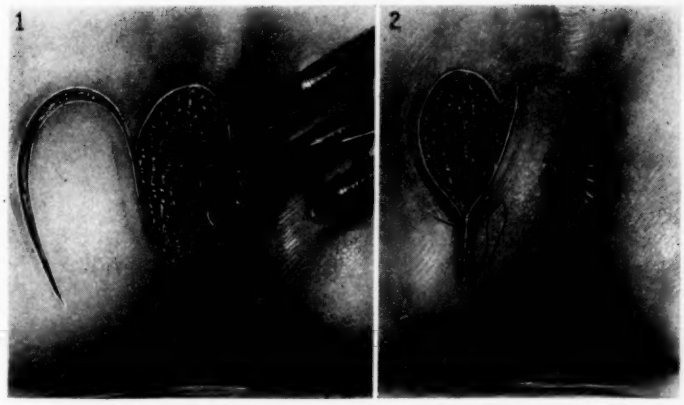


Fig. 1. Left, Showing the manner in which the flap is cut for resurfacing one-half the perianal area.

Fig. 2. The flap has been sutured medially and the closure of the lateral defect begun. It is usually possible to close this incision, but if there is any tension, the superior portion is allowed to granulate.

Young, F., and Scott, W. J. M.: Radical Operation for Intractable Pruritus Ani. *Surgery*, 1943, 13: 911.

Pruritus ani is a syndrome rather than a definite disease, which is characterized by intense itching usually about the anus. The itching is aggravated by warmth and hence is often more troublesome at night. Many factors probably contribute to the cause of this symptom, of which, moisture of the perianal skin is of foremost importance. In most instances of chronic pruritus ani, the perianal skin becomes leathery, thickened, and often excoriated by scratching. Microscopically, the skin shows nothing other than increased deposits of pigment and evidence of chronic inflammation.

Various forms of treatment have been used, such as scrupulous cleanliness and the use of drying ointments and powders. Occasionally, systemic diseases such as diabetes, when controlled, will relieve this symptomatology. Occasionally, stubborn cases appear which are not relieved by any of these measures. It is for this type of case that the authors suggest operative procedures for the relief of symptoms.

The operation suggested consists of excision of a portion of the involved perianal skin. It is emphasized that only one-half of the involved perianal skin should be excised at one sitting, since scarring secondary to infection might be the cause of contracture of the anal orifice. In brief, the procedure is a complete excision of the scarred perianal skin, one hemisphere at a time and a shift of a flap of skin from the medial surface of the buttocks and thighs to the excised area. This procedure is well demonstrated in Figures 1 and 2. The mucosal edge is prevented from retracting inward by a number of guy sutures. The external sphincter muscle is exposed and the scarred skin and subcutaneous tissue are dissected from it. This scarred tissue is then cut away. A skin flap and subcutaneous tissue of correct size and shape to cover the defect is cut lateral to the defect with its base posteriorly. It is swung across and sutured to the anal mucosa and the medial line of excision. The defect left laterally is sutured as far as possible and if tension is observed the remainder of the defect is left to granulate.

J. Garrott Allen, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Peller, S.: Malignant Tumors in Persons with Cirrhosis of the Liver. *Am. J. M. Sc.*, 1943, 205: 798.

Among 6,596 records of the Bellevue Hospital, New York, covering the period from 1934 to 1941, cirrhosis of the liver was found in 9 per cent of the patients over twenty years of age. About 30 per cent of the cirrhosis cases were classified as "early."

In 17 per cent of the patients with cirrhosis malignant tumors were found, and the ratio in men was approximately the same as in women. Compared with the patients without cirrhosis, those with cirrhosis had a ratio of intrahepatic tumors of 1 to 4. Thus, of 4,365 males without cirrhosis 17 (0.39 per cent), and among 443 males with cirrhosis 18 (4.06 per cent) had a primary tumor. Furthermore, males with cirrhosis showed an increased ratio of malignant tumors of the mouth, pharynx, larynx, and esophagus. On the other hand, when all the malignant tumors were taken together, in males with cirrhosis the percentage of all malignant tumors (stomach, kidney, bladder and prostate, lungs,

breasts, thyroid) was the same as in males without cirrhosis, while in women there was a statistically insignificant difference in favor of the cirrhotic group. The degree to which the ratio of tumors of all these "other organs" was diminished varied inversely with age.

As regards the race factor, the association of cirrhosis and malignant tumor of the liver in colored men was more frequent than in whites. The author adds, "thus if by dietary or other measures cirrhosis of the liver could be prevented, the organ distribution of malignant tumors in human beings would change, but the total incidence of cancer scarcely would be reduced." EDWIN J. PULASKI, M.D.

Ferracani, R. S.: Pharmacological Study of the Sphincter of Oddi; the Effect of Drugs on the Intracanalicular Pressure (Exploración farmacológica del esfinter de Oddi; acción sobre la presión intracanalicular). *Bol. Soc. cir. Rosario*, 1942, 9: 297.

The author studied the effect of certain drugs on the function of the terminal portion of the common duct by using the following three methods: cholangiographic studies, perfusion of colored solutions, and manometric registration of the intracanalicular pressure. A duodenal tube was introduced through the mouth, while the T-tube lying in the common duct was connected with a manometer and also with a tube used for the introduction of the colored solution.

The studies were made on patients from fifteen to twenty days after operation, when the bile draining through the Kehr tube already had a normal aspect, and when the temperature was normal and the general condition of the patients good. From 20 to 25 cc. of a 1 per cent mercurochrome solution were injected into the common duct through the tubing and the first appearance of the liquid from the duodenal tube was noted.

The author concluded from his studies that the terminal portion of the common duct reacts to various drugs, which may produce either a hypertension (morphine, pilocarpine, eserine) or hypotension (atropine, amyl nitrate).

While under normal conditions the colored solution emerges from the duodenal tube within from thirty to fifty seconds after its introduction into the common duct, in pathological cases, such as those of residual calculus, pancreatitis, and hypertension of the sphincter of Oddi, a great delay (up to from two to ten minutes) may be noted. In cases of complete obstruction, a hypertension created by an injection of mercurochrome may cause pain and nausea. In such instances an aspiration through the Kehr tube, from fifteen to forty minutes after the introduction of the solution, recovers a great part of the liquid injected.

Of all the drugs studied, morphine furnished the best clear-cut results: it produced a hypertension of the sphincter of Oddi with a resulting rise of the intracanalicular pressure. The passage of a colored solution may in such cases require from twenty to thirty minutes. Pain and nausea may be relieved by aspiration of the injected liquid or by the administration of antispasmodics. Pantopon acts in a manner similar to that of morphine.

Parasympathicomimetic drugs, such as pilocarpine and eserine, also increased the intracanalicular pressure, pilocarpine apparently having a stronger action than eserine. A dose of 0.001 mgm. of pilocarpine was used in the experiments.

Atropine and amyl nitrate did not prove very effective in counteracting the effect of hypertension provoked by morphine.

Splanchnic anesthesia causes a relaxation of the sphincter of Oddi and relieves pain provoked by a high intracanalicular pressure by interrupting the transmission of pain sensations to the cortical centers.

Adrenaline did not display a clear-cut effect, although in some cases a relaxation of the sphincter of Oddi with a resulting fall of the intracanalicular pressure was noticed.

Glyceryl trinitrate showed an effect similar to that of amyl nitrate. JOSEPH K. NARAT, M.D.

GYNECOLOGY

UTERUS

Shute, E.: What Significance Has Uterine Retroversion? *Canad. M. Ass. J.*, 1943, 48: 514.

The amazing development of the idea that uterine retroversion causes pelvic complaints per se is considered.

A series of unselected cases was reviewed to show that the incidence of retroversion in dysmenorrhea, and especially in menorrhagia, is less than the 1 in 4 incidence of retroversion in "normal" women. Even women having sterility or backache show a lower incidence of retroversion than normal.

Pregnancy only occasionally alters uterine position, and when it does so it is nearly 4 times as apt to correct a retroversion as to produce it.

Uterine incarceration is very rare. There were approximately 17 cases reported in the world's medical literature in the last ten years.

The incidence of retroversion in abortions is not abnormal.

In a review of an unselected series of 35 uterine suspensions, the results were deplorable with few exceptions. CHARLES BARON, M.D.

Martius, H., and Kepp, R. K.: Results of Treatment of Cervical Cancer in the Goettingen University Gynecological Clinic from 1932 to 1935, with Special Consideration of Supplemental Intravaginal Irradiation (Ergebnisse der Behandlung des Gebaermutterhalskarzinoms an der Goettingen Universitaets-Frauenklinik in den Jahren 1932–1935 mit besonderer Berueecksichtigung der intravaginalen Zusatzbestrahlung). *Zbl. Gyn.*, 1942, 66: 2.

During the period from 1932 to 1935 patients with cancer of the cervix were treated either with the customary x-ray irradiation and radium alone, or with a supplemental intravaginal application of the x-rays. Both groups consisted of approximately the same number of cases.

As a rule, 1,200 roentgens were applied to the surface of the body, the total amount being divided into 6 irradiations. Two abdominal and 2 lumbar fields, 10 by 15 cm. in diameter, were used. Ten roentgens were given per minute, and in addition 4 applications of 200 roentgens each were applied to the vulvoperineal field, which had dimensions of 8 by 10 cm. An intravaginal irradiation of parametria consisted of 4 or 5 applications of 400 roentgens each, but sometimes from 10 to 12 applications of 200 roentgens were given. For this purpose radium was introduced into the cervix or into the tumor. A still greater dose was not necessary to irradiate tumor tissue attached to the pelvic bones. A proper centering of the irradiation cone was the clue to success. The intracervical application of radium was not replaced but was supplemented by the intravaginal x-ray irradiation. The distribution of rays within the primary tumor was very favorable when radium was employed.

The principle of elective therapy was employed in the selection of cases for operation, and operation was done only when the tumor was confined to the cervix and when there were no other contraindications. Of 40 patients operated on, only 1 died as a result of the operation. If the local conditions made an operation feasible but there were some other contraindications, irradiation was employed. In approximately one-half of this group an intravaginal irradiation of the parametria was done. Of 255 patients only 2 died as a result of this radiation therapy.

A follow-up system showed that five-year cures were obtained in 68.8 per cent of treated, locally operable cases, and 28.2 per cent of all treated, inoperable cases. Better results were obtained in cases irradiated through the vagina, as compared with cases without this supplemental treatment. Sometimes tissues close to the bladder or the rectum had to be irradiated, with the resulting danger of a vesicovaginal or rectovaginal fistula. However, a comparison of cases in which the supplemental intravaginal treatment had been employed, with cases treated in the customary manner, did not show any increase of frequency of fistula formations. The new x-ray tube devised by Witte, with a very small anode, promises a still greater reduction of the aforementioned complication by facilitating the focusing of the tube.

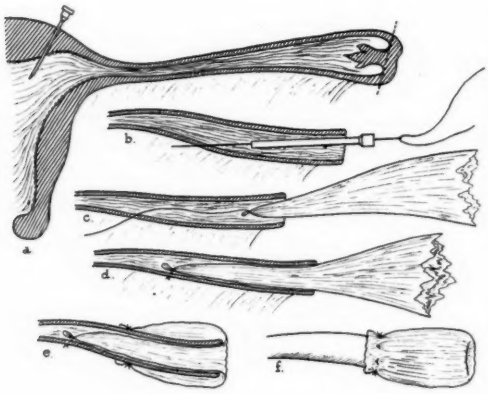
The authors conclude that the supplemental intravaginal irradiation represents a valuable addition to our armamentarium in the fight against cancer.
JOSEPH K. NARAT, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Gepfert, J. R.: Reconstruction of the Oviducts in the Human Being. *Am. J. Obst.*, 1943, 45: 1031.

Twenty-eight cases on which reconstruction of the oviducts was carried out are reported. Twenty-four of these were followed up for a minimum of six months and 4 were lost to observation with results unknown. In 21 of the 24 cases the tubes were patent three months after operation, but in 3 they were subsequently found to be occluded. The location of the occlusion in one is unknown. In the other 2 the point of occlusion was in the fimbriated end, as confirmed by lipoidol in one and subsequent operation in the other. The patient in the last case was operated upon and the plastic procedure originally carried out was done again. Insufflation now shows patency at 130 mm. of pressure. It is interesting that the fimbria were found inverted for the second time in this patient, which showed that the technique had definitely been faulty in this case.

Of 24 patients followed up for six months or more, 18 had patent tubes. In no case was it necessary to



use pressure in excess of 135 mm. of mercury to establish this patency. Of these 18 patients, 17 had ample opportunity to become pregnant, and no defect which would be sufficient to prevent this outcome was established. The husbands were carefully checked in each case previous to the operative intervention.

In spite of these precautions, 1 patient had a normal term infant; the other aborted at less than three months and is now again in her third month of pregnancy, as confirmed by clinical examination and the Aschheim-Zondek test. There have been no ectopic pregnancies. Occasional delayed menses have been common to many of the patients, but must be ascribed to the tremendously important psychological effect of the anticipation of pregnancy rather than to conception and abortion.

EDWARD L. CORNELL, M.D.

EXTERNAL GENITALIA

Waegeli, C.: Five Years of Colposcopy (Cinq années de colposcopie). *Rev. méd. Suisse rom.*, 1942, No. 11: 857.

Within five years the author employed colposcopic examinations in 651 patients. Practically every gynecological patient was examined in this manner, except virgins and women in the gestation period exceeding three months. In 15 per cent of the cases abnormalities were found: namely, mosaic zones in 58 patients; similar zones combined with bases of leucoplakia in 12; leucoplakia in 6; leucoplakia associated with mosaic zones or with bases of leucoplakia in 13; carcinoma in 1, bases of leucoplakia in 4, erosions in 7, and erosions associated with mosaic zones or bases of leucoplakia in 2. The classification is that suggested by the originator of colposcopy, Hinselmann.

Histological examinations confirmed the colposcopic findings in each instance in which a biopsy was obtained. This was done in 11 cases. The author emphasizes the great importance of experience in interpretation of colposcopic findings.

Cancer of the cervix develops only from atypical epithelium which may exist for a long time without any signs of erosion or ulceration. Only colposcopic examination is able to detect this latent stage of cancer. No gynecological examination is complete without a colposcopic study. If the Schiller test is positive, a colposcopic examination is absolutely indicated. JOSEPH K. NARAT, M.D.

Brown, R. L.: Fatal Air Embolism after Insufflation of the Vagina. *Lancet*, Lond., 1943, 244: 616.

A primipara, aged twenty-five, was due to be confined on July 10, 1942. Diagnosed as presenting the left occipitoanterior position, the head was reported engaged on June 6. She had complained of vaginal discharge in April, for which she received treatment by douching and painting. On May 8, treatment by vaginal insufflation of yellow "picragol" powder given three times a week was started, and by May 22 she was reported so much improved that she was told she need not report again for treatment. Vaginal discharge recurred by July 1. The report on the vaginal smears stated that there were large amounts of monilia present, no gonococci being seen. Further vaginal insufflations were advised, and treatment was begun on July 3. Within a minute of the start of insufflation she complained of a feeling of being blown up; acute dyspnea supervened; and she had a convulsion, recovered slightly, then died.

At autopsy she appeared rather bloated and cyanosed. There were no post-mortem gas changes in the body. The heart was enlarged, the right side dilated, the right atrium empty, and the right ventricle contained very little blood but it was frothed into large bubbles. The blood was approaching arterial blood in color but was not so bright. The left side of the heart and the valves were normal. The aorta and coronary vessels were normal, and the pulmonary arteries were empty. The right uterine plexus contained frothy blood similar in color to that found in the right ventricle, but it was less bright. The right ovarian vein contained particles of yellow powder. The uterus was about full term, and contained a male fetus with its head in the brim of the pelvis. The cervix was drawn up and dilated to two fingers. The placenta was in the upper part of the uterus slightly over to the right. The edge of the placenta was stripped for a depth of from 1 to 1½ in. from the right side of the uterus. The membranes on that side were completely free. The membranes on the left side were normally fixed. There was slight hemorrhage on the right side from the placental site, and blood had run down slightly toward the internal os. Blood sinuses on the right side of the uterus in the vicinity of the stripped part of the placenta and membranes contained frothy blood, brighter in color than venous blood, but not so bright as the arterial. These sinuses drained directly into the plexus of veins on the outer side of the uterus, which (as already noted) contained similar frothy blood.

Insufflation of the vagina with the cervix partly dilated had allowed the entrance of air into the blood sinuses of the uterus, after the ballooning effect of the insufflation had stripped the membranes and a portion of the placenta from their site. Death had been caused by air embolism.

DANIEL G. MORTON, M.D.

MISCELLANEOUS

Caffier, P.: The Problem of Violent Ovulation in Human Beings (Zur Frage der violenten Ovulation beim Menschen). *Zbl. Gyn.*, 1942, 66: 742.

The author is convinced that violent ovulation occurs, even during the second half of the menstrual cycle, in a woman with regular menstruation. Sexual intercourse produces a hyperemia of the internal genital organ. Posterior parametritis may result from excessive masturbation or repeated coitus interruptus. A girl with hypoplastic genital organs, with or without menstrual disorders, frequently develops into a normal woman after a few months of married life. Apparently the hyperemia of the genital organs following the sexual life corrects the hypoplastic conditions. Colpitis and marked edema may result from an overindulgence in sexual life.

The role of the central nervous system in processes of propagation have been definitely established. Relations between the hypophysis and midbrain on one hand and genital functions on the other hand have been demonstrated by animal experimentation. A sexual intercourse acts as a stimulus of the central nervous system, with the resulting excretion of the hormone of the anterior pituitary lobe. Hyperemia and hormonal factors supplement each other in the production of a follicular rupture.

The purpose of a violent ovulation is to facilitate conception by bringing the time of ovulation and sexual intercourse as close together as possible.

It has been shown that a large dose of follicular hormone produces changes in the ovaries similar to those caused by the hormone of the anterior pituitary lobe. However, follicular hormone also produces a very pronounced hyperemia of the ovaries. The riper the follicle, the greater the hyperemic effect of the follicular hormone. It may be assumed that already the preliminary phases of the sexual act cause under certain circumstances an acute excretion of the hormone of the anterior pituitary lobe which accelerates the ripening of the follicle; in a ripe or nearly ripe follicle the production of follicular hormone is intensified. The resulting hyperemia provokes a rupture of the follicle.

The terms "provoked ovulation" and "violent ovulation" are used as synonyms and are applied to the influence of sexual intercourse on ovulation.

JOSEPH K. NARAT, M.D.

Pineda, R.: Treatment of the Surgical Menopause by the Implantation of Estrogenic Crystals (Tratamiento de la menopausia quirúrgica por la implantación de cristales de estrógenos). *Sem. méd.*, B. Air., 1943, 50: 693.

The author reports results obtained from an implantation of crystals of estrogenic substances in 70 patients after surgical castration. He draws the conclusion that such implantation furnishes effective and durable results. Inconveniences of the method are of minor importance, and intolerance can be disregarded from the practical point of view. Either a natural hormone or dioxydiethylstilbene dipropionate or diacetate may be used. The effect on the symptomatology of the menopause is immediate. Reappearance of the libido is the best proof of the effectiveness of the therapy. Vaginal smears clearly indicate the progress of the estrogenic therapy. The optimal dose necessary to obtain an effect of more than six months' duration is 20 mgm. An incision only 1 cm. long is necessary; the crystals are placed 2 cm. below the skin. In 48 patients the author used synthetic products and in the remaining cases estradiol dipropionate. JOSEPH K. NARAT, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Kapeller-Adler, R., and Cartwright, J. A.: Vitamin B_1 and Toxemia of Pregnancy. *Edinburgh M. J.*, 1943, 50: 305.

The authors investigated the therapeutic value of vitamin B_1 in the treatment of the toxemias of pregnancy. Recent articles published by other authors who used vitamin B_1 to treat toxemia of pregnancy did not seem to indicate any greater or more rapid improvement in patients so treated than would have resulted from simple rest in bed. Therefore, the authors decided to make the present study.

The patients were divided into cases of mild and severe toxemias. The criteria of pre-eclamptic toxemia were:

1. A blood pressure raised above 140/90 mm. of mercury.
2. Albuminuria in the absence of other complicating conditions, such as heart failure or chronic nephritis.
3. Edema of the legs, hands, face, or sacral region.

Vitamin B_1 was administered both by mouth and parenterally. Each case was carefully examined and classified and the patients were treated in the hospital.

The first 7 cases treated were so discouraging that the authors decided to investigate still further by looking for a biochemical explanation and considering the possibility that histamine metabolism may play a significant role. This further investigation was conducted on 77 pregnant women. The theory upon which this part of their study was based was that in normal pregnancy most of the histamine formed is presumably destroyed by histaminase, whereas in toxemia the activity of histidine decarboxylase may increase and the activity of the histaminase may be completely inhibited. Thus, most of the histidine would be converted to histamine, which could damage the liver and kidneys considerably.

The results of the investigation are shown in two tables and their summary is as follows:

Nineteen patients with mild or severe pre-eclamptic toxemia were treated with vitamin B1. No beneficial effect was seen in any of these cases. In the group of patients with severe pre-eclamptic toxemia the effect of the vitamin B_1 treatment may even be described as detrimental, and, taking into consideration the affinity of vitamin B_1 for histaminase, this is to be expected; therefore, the therapeutic use of vitamin B_1 in toxemia of pregnancy should be discouraged. CHARLES E. GALLOWAY, M.D.

Rosenbaum, M., and Maltby, G. L.: The Relation of Cerebral Dysrhythmia to Eclampsia. *Am. J. Obst.*, 1943, 45: 992.

Sixty-five per cent (13 cases) of 20 patients with eclampsia had electroencephalograms indicative of cerebral dysrhythmia as contrasted to 10 per cent (2 cases) of 20 patients with pre-eclampsia with the same findings. Sixty per cent (12 cases) of the eclamptics had a family and personal history of convulsive disorders, while only 10 per cent (2 cases) of the pre-eclamptics had a similar history.

It has been suggested that there may be a primary cerebral dysrhythmia in the patients having the syndrome of eclampsia, and that the associated toxemia may be the "trigger mechanism" that exaggerates the inherent dysrhythmia to the degree that convulsions appear. The careful taking of histories together with electroencephalograms might be of aid in predicting which patients may develop eclampsia. The prophylactic therapy of eclampsia may include anticonvulsant drugs. EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

Page, E. W., and Woods, L.: Clinical Effects of Oral Anhydrohydroxyprogesterone on the Motility of the Human Gravid Uterus. *West. J. Surg.*, 1943, 51: 225.

Anhydrohydroxyprogesterone (pranone, pregnenynolone, ethinyl testosterone) will prevent abortion in castrated rabbits, will inhibit uterine motility in the rabbit, will produce secretory endometrium in postmenopausal women, and may induce withdrawal bleeding in primary amenorrhea. Little is known of its effect on the pregnant human uterus.

Because progesterone has been advocated for the treatment of threatened abortion, the authors have investigated the effect of pranone on the outcome of spontaneous threatened abortion. In a series of 37 consecutive cases with only mild bleeding and no cramps, none aborted. Of this group, 7 were given corpus-luteum hormone and 30 received no treatment except that of bed rest. Of 55 cases with bleeding and cramps, 32 received corpus-luteum hormone with an abortion rate of 59 per cent, and 23 received no hormone therapy with an abortion rate of 52 per cent. Of the 53 cases treated by bed rest alone, only 22 per cent aborted. Thirty-one cases were treated with pranone and of this group 25 per cent aborted.

Twenty-one patients with painful uterine contractions during late pregnancy were given a total of from 20 to 300 mgm. of pranone, and in only 46 per cent was relief of the pain noted.

In 28 patients with "after pains," no relief was noted from the use of pranone. Single doses of from 50 to 120 mgm. were given from eight to twenty-four hours prior to the induction of labor in 7 patients. All went into labor and the average duration of labor for the group was seven hours. Only 1 patient had weak pains. In addition, from 60 to 80 mgm. of the drug were given to 4 women with spontaneous onset of labor during the sixth and seventh months. No delay in the progress of the labors was noted.

The authors conclude that the administration of pranone in the dosages they used had no effect on the progress of threatened abortion, nor were they able to demonstrate a decrease in uterine motility during labor and the postpartum period from the use of the drug. J. ROBERT WILLSON, M.D.

MISCELLANEOUS

Folsome, C. E.: The Status of Artificial Insemination. *Am. J. Obst.*, 1943, 45: 915.

Extensive experiments lead to but one conclusion. The need for heterologous artificial insemination is diminishing in direct proportion to the increasing knowledge about the male sex cells and the ovulatory mechanism in the female. The status of artificial insemination as a means to overcome sterility in the barren couple, wherein the male is principally at fault, is a medical procedure valuable only as a final answer in certain carefully selected and thoroughly studied cases. This procedure offers no unusual promise as a panacea in the control of human male sterility. The results obtained by resorting to artificial inseminations have been little more than mediocre, except in the case of Seymour and Koerner. In the exception noted the careful reader will do well to review the unique findings with reasonable doubt, for this report, provocative of numerous inquiries anent its analytical reliability, contains numerous discrepancies and is at curious odds with the findings as reported by all others in the medical literature.

Artificial insemination may have its place in the medical armamentarium in the relief of sterility, although modern research in the physiology of human reproduction indicates that resort to it will become less and less necessary. The conservative physician will agree with Guttmacher, "Artificial insemination must never be an assembly line kind of medical treatment;" although, in the selected and carefully studied cases the successful procedure may eventuate into "one of the most satisfying of medical experiences." EDWARD L. CORNELL, M.D.

Douglas, H. S.: Simple Amenorrhea or Pregnancy? The Use of Prostigmine in Differentiation and Treatment. *West. J. Surg.*, 1943, 51: 245.

Since hyperemia of the uterus must precede menstruation, the administration of a drug which will produce this state in the tissues should induce menstrual flow if the lack of hyperemia is the causative factor in the delay of the period. The acetylcholine-liberating property of estrin is thought to produce the normal premenstrual hyperemia. Prostigmine potentiates acetylcholine by inhibiting cholinesterase, the enzyme which normally destroys this substance, and thus may induce menstrual flow.

The author reports a series of 62 patients on whom the test was used. In 28 nonpregnant patients menstruation began within three days of the injections; 2 post-partum patients failed to respond, but were later shown not to be pregnant; 2 other patients, one with hypothyroidism and the other with an infantile uterus, failed to bleed although neither was pregnant. The remainder of the patients were pregnant and in none was there any bleeding after the injection of prostigmine.

The author concludes that the prostigmine test is a reliable test for pregnancy, which in his hands has produced results comparable to those of the Friedman test. J. ROBERT WILLSON, M.D.

Kerr, A., Jr.: Weight Gain in Pregnancy and Its Relation to the Weight of Infants and to Length of Labor. *Am. J. Obst.*, 1943, 45: 950.

A study of 500 normal primiparas is presented in which data obtained are applied to the problem of weight gain in pregnancy and its relation to weight of infants and to length of labor. Percentage weights have been employed, graphs constructed, and linear correlation coefficients calculated.

A tendency is shown for increasing weight gains in pregnancy to be associated with infants of heavier weights. There appears to be only a very slight tendency for women who gain increasing amounts of weight to have longer labors. The increase in infant weight associated with increased weight gain appears to have no influence upon the duration of labor. There appears to be some tendency for the larger women to gain more weight during pregnancy and a slight tendency for them to give birth to larger infants. The use of percentage weight in expressing weight gain in pregnancy and infant weight is a useful method in dealing with weight gain and weight of the infant. EDWARD L. CORNELL, M.D.

Adam, G. S.: The Rh Factor and Its Application to Obstetrical Practice. *Med. J. Australia*, 1943, 1: 507.

Severe reactions following the transfusion of pregnant and puerperal patients may be explained on the basis of the Rh factor of Landsteiner and Weiner. Since agglutinins against the Rh factor do not occur normally in human plasma, an initial transfusion given to an Rh negative individual from an Rh positive donor may produce no reaction. The introduction of the Rh positive blood, however, may result in agglutinin formation and a fatal reaction from subsequent Rh positive transfusions.

If the mother is Rh negative and the father Rh positive the baby may be Rh positive, and if fetal blood cells leak through the placenta the agglutinins may be produced by the mother's blood. Thus, if the Rh positive father is used as a donor a reaction may follow.

If transfusion is required in a pregnant patient the husband should not be used as the donor. This is true especially if the woman has delivered a baby with erythroblastosis fetalis since, usually, in this condition the father is Rh positive, the mother Rh negative, and the baby Rh positive.

Infants with erythroblastosis should be transfused with Rh negative blood which contains no anti-Rh

agglutinins. The mother's blood contains agglutinins and thus further blood destruction will follow its use. Although the father is Rh positive he should not be used as a donor because the antibodies which have passed from the blood of the mother to that of the baby will agglutinate the donor cells.

The author suggests the use of known Rh negative donors without anti-Rh agglutinins for any pregnant patient or erythroblastotic baby requiring transfusion. J. ROBERT WILLSON, M.D.

Gratch, I.: Bacillus Proteus OX19 Agglutinated by the Serum of Pregnant Women. Preliminary Report. *Am. J. Surg.*, 1943, 60: 411.

During a series of researches that were conducted at the suggestion of a distinguished colleague for the purpose of making an epidemiological survey to detect, if possible, the incidence of rickettsia diseases (typhus, Rocky Mountain spotted fever) in the Philadelphia area, an interesting fact appeared. The researches were made by means of an agglutination test, and the different strains of bacillus proteus OX were used as antigens. The author noticed the exceptional frequency of a positive agglutination test, particularly with the strain proteus OX19, in cases of sera from pregnant women who had absolutely negative histories so far as previous typhus or other rickettsial diseases were concerned.

The technique adopted in performing this test is very simple. A drop of the serum to be tested is pipetted with a small pipette onto an ordinary slide.

To this is added a drop of proteus OX19 antigen, which is shaken gently before it is used. The serum and antigen thus prepared on the slide is mixed thoroughly with a separate toothpick or with the tip of the capillary pipette. After the mixing, the glass slide is gently rocked back and forth from ten to twenty times, and during this rocking the slide is studied carefully for the appearance of the clumping. In cases in which a marked agglutination will occur, the clumping is observed with the naked eye after ten to thirty seconds; seldom is it necessary to wait as long as one or two minutes. Only in a few doubtful cases, particularly in cases with a slow belated agglutination in the "false positive" tests, did the author make the observation with the aid of the microscope.

The results of 1,212 tests made on the sera of men and women are summarized as follows:

Of the 412 sera taken from men, 390 gave a negative agglutination test, while 22 gave a positive test. Of these 22 positive cases in men, 2 were affected with carcinoma, 2 had previously received injections of an autogenous vaccine, and thus far there is no satisfactory explanation for the positive results obtained for the remaining 18 men.

The group of 800 women gave 288 negative tests (in nonpregnant women) and 512 positive tests. Of the 512 women, only 7 were not pregnant, but all of the 7 (as also in the cases of the 2 men already mentioned) were affected with a malignant tumor. All of the 505 pregnant women, i.e., 100 per cent of the pregnant cases examined, gave a positive test.

The author has not yet established the stage of pregnancy at which the test first begins to yield a positive result, nor how soon after delivery (or after abortion) the test becomes negative.

The value of the test for the routine diagnosis of pregnancy is discussed, as well as the possible reasons for the positive results which were encountered in the cases of malignancy and other complications.

DANIEL G. MORTON, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Lisa, J. R., Eckstein, D., and Solomon, C.: The Relationship between Arteriosclerosis of the Renal Artery and Hypertension. An Analysis of 100 Necropsies. *Am. J. M. Sc.*, 1943, 205: 701.

The authors measured the caliber of the renal arteries in 100 consecutive individuals coming to necropsy. In this group there were 56 individuals with hypertension and 44 with a normal blood pressure. It was noted that there was no significant difference in the caliber of these vessels in the two groups. This finding is contrary to the report of Blackman, who measured the renal vessel caliber of 100 individuals following fixation and histological section. It was noted that in comparing the vessel caliber before and after fixation correlation was impossible; so the authors measured their vessel caliber before fixation.

The nonsclerotic vessels were regarded as normal. Among the hypertensives 40 per cent of the vessels were of this character, while in the nonhypertensive group 56.8 per cent of the vessels were of this character. The average diameter of the hypertensive individual's renal artery was 4.1 mm., while an individual with normal tension demonstrated a 4 mm. diameter. In only 2 instances was there found definite narrowing of the renal artery suggestive of the Goldblatt dog. In observing the sclerotic vessels it was noted that the lumen was often greater than in the nonsclerotic group.

On examination of the kidneys of this group of individuals it was noted that the degree of arteriosclerosis proved a more reliable guide to the blood-pressure level than the caliber and condition of the renal arteries. Hence, these authors believed that this work supported the contention of Page who suggested that the lower pulse pressure within the kidney was more significant than the gross reduction of blood flow, which is the contention of Goldblatt.

ROBERT LICH, JR., M.D.

BLADDER, URETHRA, AND PENIS

Mirabile, C.: Resection of the Bladder Neck for Obstruction in Women. *N. England J. M.*, 1943, 228: 751.

The author discusses female bladder-neck obstructions and briefly reviews the literature. He points out that the urethral glands of the female are homologous to the male prostate and that these glands can and do enlarge on occasion to simulate the prostate, as was pointed out by Young. Hence, if these glands are capable of such development and subject to infections, fibrosis of the vesical neck with bar formation is possible, along with adenomatous enlargement similar to that found in the male. It was Caulk, in 1921, who first reported vesical neck obstructions in the female.

Chronic infection seems to be the common cause for vesical-neck obstruction in the female. The signs and symptoms are comparable to those of the obstructed male vesical neck; i.e., urinary hesitancy, difficulty, and diminished pressure. The clinical picture is that of vesical-neck obstruction with secondary signs of urethral obstruction. The morphological findings at the vesical neck are often not pronounced and the obstructing tissue is minimal.

The case reported demonstrates that urethral dilatation will be of no avail and that the best treatment is transurethral resection. The amount of tissue that it is necessary to remove may be minimal and the results maximal. The author calls attention to the fact that incontinence following resection is more theoretical than of practical importance. However, it must be appreciated that the amount of tissue between the urethral wall and vagina is limited.

The case reported is that of a fifty-four-year-old white female who presented a residual pyuria of 2,000 cc., with urinary difficulty over a sixteen-year period and final acute urinary retention. Sounds passed to the caliber of 28°F. failed to reduce the residual urine, but did afford some symptomatic relief. Contrast roentgenology demonstrated some renal back pressure, and sacculation and diverticula of the bladder. Renal excretory studies and the blood chemistry were not particularly significant.

The patient submitted to a diverticulectomy and since the urethral lumen seemed of adequate caliber, nothing more than dilatation was done. Postoperatively the patient continued to demonstrate urinary retention and pyuria so that four months later a transurethral resection was executed and 2 gm. of tissue were removed from the vesical neck. The pyuria and vesical retention disappeared immediately. Also, the vesical capacity returned to 350 cc. and a cystogram was normal.

ROBERT LICH, JR., M.D.

GENITAL ORGANS

Shivers, C. H. deT.: The Medical Findings in Benign Prostatic Hyperplasia; A New Method of Grouping Cases for Operation. *J. Urol.*, Balt., 1943, 49: 847.

The author discusses the advisability of studying patients with prostatic hyperplasia, not only urologically, but also from a medical aspect, and of evaluating thereby the most expedient method of therapy. The author suggests particularly that the patient's cardiac status be most carefully evaluated and the upper urinary tract studied by intravenous pyelography and, where indicated, by retrograde pyelography. The author's method of grouping prostatic hyperplasia is illustrated.

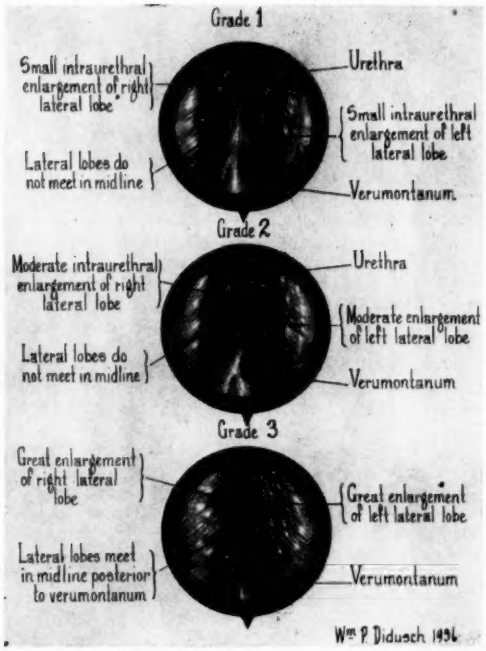

Grade 1
Small intraurethral enlargement of right lateral lobe
Urethra
Small intraurethral enlargement of left lateral lobe
Lateral lobes do not meet in midline
Verumontanum
Grade 2
Moderate intraurethral enlargement of right lateral lobe
Urethra
Moderate enlargement of left lateral lobe
Lateral lobes do not meet in midline
Verumontanum
Grade 3
Great enlargement of right lateral lobe
Great enlargement of left lateral lobe
Lateral lobes meet in midline posterior to verumontanum
Verumontanum
Wm P Diduch 1956

Fig. 1. Intraurethral prostatic hypertrophy: grades 1, 2, and 3.

The author notes that cases selected for transurethral surgery should have a normal upper urinary tract, but the cardiovascular system need not be normal. Cases for a single-stage prostatectomy should demonstrate a normal urinary tract in addition to a cardiovascular system which is normal for the age of the patient. Unilateral upper urinary-tract pathology in addition to cardiovascular abnormality is an indication for prolonged vesical drainage prior to prostatectomy. If the damage to the upper urinary tract is bilateral and the cardiovascular changes are marked, the patient is usually not a suitable prostatic operative risk. This patient must depend on catheter or transvesical drainage.

To substantiate the aforementioned therapeutic indications the author reviews his operative results during the past eight years. A total of 501 patients were operated upon; 145 by transurethral prostatic resection with a mortality of 0.69 per cent; 69 by a single-stage prostatectomy without mortality; and 287 by a two-stage prostatectomy resulting in a mortality of 3.82 per cent. ROBERT LICH, JR., M.D.

Emmett, J. L.: Transurethral Resection with the Cold Punch; Operative Technique. *J. Urol.*, Balt., 1943, 49: 815.

A variety of instruments has been designed in the past for transurethral resection. One by one they gradually have been discarded, until today two chief types of instruments remain in use. These are: (1) the wire loop, activated with a high frequency cutting type of electric current and associated with a foroblique telescopic lens system (Stearn-McCarthy resectoscope), and (2) the cold punch instrument, which cuts with a cold tubular knife and has no telescopic equipment (Braasch, Bumpus, and Thompson resectoscope). Adequate and satisfactory operations can be done with either of these instruments if the surgeon is sufficiently trained in their use. Each instrument has its advantages and disadvantages.

Experience at the Mayo Clinic with a large number of resections has left the author with the opinion that low spinal anesthesia is the anesthetic of choice. The basic principles of technique in transurethral resection are much the same regardless of the type of instrument employed. Details, however, may differ considerably. The remainder of this paper is limited to a consideration of technique employed in transurethral prostatic resection with the cold punch.

The actual mechanics of cutting tissue with the cold punch is quite simple although there are a few refinements in technique which are helpful to know. With the tubular knife in the closed position (so that the fenestra is occluded) and the water inlet open, one observes the portion of tissue to be cut. The knife blade is then opened its entire distance (unless for some reason a shorter bite is desired) and the resectoscope is advanced sufficiently to allow the tissue to enter the fenestra. An attempt is made to fill the lumen of the resectoscope almost completely with the tissue so that the piece of tissue cut will be of generous size. The knife is then thrust forward, cutting off the piece of tissue. When the knife is opened again, the piece of tissue will be dislodged and in most cases will fall free into the bladder because of the force of water constantly running through the resectoscope. If the piece of tissue sticks in the knife, it can be dislodged by one of three maneuvers: (1) rapidly moving the knife backward and forward several times, taking care that the fenestra is not in a position to engage more tissue, (2) shaking the whole resectoscope backward and forward with a short quick motion, or (3), if these methods do not work, the blunt specimen forceps can be introduced through the resectoscope (after the eyepiece has been removed) and the piece of tissue grasped or dislodged into the bladder. Usually, several pieces of tissue can be cut and allowed to fall into the bladder before the bladder becomes sufficiently distended so that it should be emptied At this point the water inlet is closed, the large outlet valve is opened and the water and pieces of tissue are washed out of the bladder. When the tissue cannot be washed out readily, it may be necessary to use the suction syringe or remove larger pieces of tissue with the blunt specimen forceps.

The number of pieces of tissue one may cut between each emptying of the bladder depends upon

the speed with which the resection is being done and the capacity of the bladder. There is no set rule. The surgeon will soon recognize quite easily when it is time to empty the bladder. Generally speaking, it is unwise to subject the bladder to too much overdistention as this predisposes to a postoperative febrile reaction.

Incompletely cut pieces of tissue hanging by a few fibers of tissue or mucosa often prove very annoying to the beginner in this type of work. This situation results from: (1) a dull knife, (2) a knife that is too short (from repeated sharpening) so that it does not pass completely through the distal margin of the fenestra when it is thrust forward, (3) an incomplete or too slow thrust of the knife when the piece of tissue is being cut, and (4) cutting of pieces of vesical mucosa or muscle fibers which never can be cut cleanly but rather tend to tear or "jam" the knife. Such an incompletely cut piece of tissue may be removed by carefully engaging it in the fenestra, holding it in place with the knife blade and then, with a quick, short, pulling or thrusting motion, tearing it loose from its pedicle. In some cases, rotation of the resectoscope through an arc of 180 to 360 degrees is a better procedure.

Mercier, O.: End-Results of 900 Cases of Transurethral Resection of the Prostate. *J. Urol.*, Balt., 1943, 49: 665.

In reciting the end-results of 900 cases of transurethral resection of the prostate, the author does so in an endeavor to urge young urologists to acquire dexterity in the technique of this operation.

After treating 42 patients by this technique, he concluded in 1933 that the operation should be restricted to certain carcinomas of the prostate, to bars of the bladder neck, and to limited prostatic hypertrophy.

In 1938, he believed that the indications were widened by experience so that prostates of the size of 50 gm. were thus treated. In the last sixteen months resection has been applied to practically all cases of prostatic hypertrophy, prostatectomy being resorted to only in those cases which required cystostomy because of the concomitant presence of calculi, tumors, or diverticula.

Of the first 25 patients operated upon transurethrally, 8 died; from the 150th to the 300th patient, 8 died; from the 300th to the 500th, 5 died, and from the 500th to the 900th, only 3 died.

As experience is gained, the tendency to overcoagulate is gradually avoided. Overcoagulation may cause grave secondary hemorrhage between the tenth and twelfth days and elimination of the coagulated tissue often impedes recovery.

Compression catheters have been abandoned in the after-treatment and a Marion rubber catheter is used; this is allowed to remain in place for three days but in those cases with postoperative fever, the catheter is not removed until the temperature returns to normal. Sulfonamide medication also is used postoperatively.

In these 900 cases, the amount of tissue removed transurethrally varied from 2 to 182 gm.

Transurethral resection has been abandoned as a surgical procedure if cystostomy has been performed. Only 9 cases had a second operation.

The mortality should be approximately 1 per cent. The morbidity should be about the same from transurethral prostatectomy as from any of the other surgical procedures used for prostatectomy.

ELMER HESS, M.D.

MISCELLANEOUS

Flynn, W. A.: Sulfapyridine Anuria and Its Treatment. *Lancet*, Lond., 1943, 244: 648.

The author reports his experience with massage in 8 cases of ureteral obstruction due to sulfapyridine crystals. It is interesting that these cases were treated by massage of the kidney and ureter abdominally and the lower ureter per rectum. When nausea and vomiting prevented adequate fluid intake saline solution was administered intravenously to institute solution of the obstructing crystals. The exact technique of massage is outlined by the author.

It is pointed out that if this method does not cause a normal flow of urine, ureteral catheterization is indicated. The cases reported were those of patients experiencing an early reaction following the exhibition of sulfapyridine for the treatment of acute gonorrheal urethritis. ROBERT LICH, JR., M.D.

Ruskin, S. L.: The Influence of Vitamin C on Wassermann Fastness in Syphilis. *Am. J. Digest Dis.*, 1943, 10: 170.

The authors present several patients who were observed under the influence of vitamin C; regarding Wassermann fastness in syphilis they conclude:

1. Vitamin C apparently enhances the spirocheticidal effect of bismuth and the trypanosomicidal effect of antimony.

2. Wassermann fastness is related not only to the mechanism of inhibitors, but also to the chemotherapeutic index of the bismuth preparation employed.

With all other factors equal, the addition of bismuth cevitamate was able to change the Wassermann-fast positive to a Wassermann negative result in 7 Wassermann-fast cases of the series of 10 luetics.

Vitamin C and glutathione influence the capacity for spirochetes and trypanosomes to take up arsenic, antimony, bismuth, and gold.

Vitamin C acts both as a detoxifyer of antimony, arsenic, and bismuth in the reduced state, but can enhance the spirochetal and trypanosomal action of these metals during the process of oxidation.

Bismuth cevitamate may be considered an important addition to the therapy of Wassermann-fast lues. J. SYDNEY RITTER, M.D.

LaTowsky, L. W.: Qualitative Chemical Analysis of Urinary Calculi. *J. Urol.*, Balt., 1943, 49: 720.

The chemical composition of urinary stones was at one time considered a matter of academic interest.

However, the clinical importance of knowing the type of stone formed in a given patient is a prime consideration in establishing the cause of stone formation in the individual case, as well as in giving the patient the benefit of accumulated knowledge on the prophylaxis of further stone formation. Advice in regard to dietary restrictions and urinary pH regulation may be formulated only when the composition of the stone is known.

The recently reported occurrence of urinary calculi following the administration of sulfonamide derivatives necessitates the inclusion of methods of identification for these substances in the scheme of analysis.

A method of analysis has been used for the past year in the study of 150 urinary calculi. The author claims no originality for any of the procedures for identifying specific substances.

Method of analysis. First, description of the physical appearance, including the weight and size, of the calculus. Transect the calculus with a saw. If it is laminated divide into separate layers for analysis. Second, macerate the stone, or the separate layers, and divide into one large sample and four small samples for analysis.

Finding certain ions on analysis suggests the presence of the following substances:

The ammonium ion suggests the presence of ammonium urate, ammonium magnesium phosphate, or calcium ammonium phosphate.

The urate ion suggests the presence of free uric acid, and, if ammonium ion is present, ammonium urate.

The oxalate ion suggests the presence of calcium oxalate, and rarely magnesium oxalate.

The carbonate ion suggests the presence of calcium carbonate, magnesium carbonate, or both.

The magnesium ion suggests the presence of ammonium magnesium phosphate, magnesium carbonate, or occasionally magnesium oxalate.

The calcium ion suggests the presence of calcium oxalate, calcium carbonate, calcium phosphate, or calcium ammonium phosphate.

The phosphate ion suggests the presence of calcium phosphate, magnesium phosphate, magnesium ammonium phosphate, or calcium ammonium phosphate.

The stones containing cystine, xanthine, indigo, cholesterol, fibrin, urostealith, and sulfonamides are rare.

In 150 cases of urinary calculi, 78 were chemically pure, while 72 were mixed stones.

This is a reliable method for the qualitative analysis of urinary calculi. ELMER HESS, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Lapidus, P. W.: Lesions of the Inconstant Sesamoids of the Foot. *Radiology*, 1943, 40: 581.

The author calls attention to previous publications of his on the incidence of inconstant sesamoids of the foot and presents examples in this article of cases in which they may produce disabling symptoms. Case reports with roentgenograms of fracture, calcareous tendinitis, and anomalous bipartite inconstant sesamoids are cited. A. HARTUNG, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Dennis, C.: Prolonged Dependent Drainage with "Lucite" Drains in the Treatment of Chronic Osteomyelitis. *Surgery*, 1943, 13: 900.

Therapy in the chronic stage of osteomyelitis has been widely varied. The policy for many years at the University of Minnesota Hospitals, Minneapolis, has been expectant in character, without intervention unless abscess formation, pain, or sequestrum formation appeared. Under this regimen healing with cessation of drainage occurred in only one-quarter of the cases.

Despite the moderate number of lesions which have ceased to drain or cause pain or fever, the impression remains that no standard method of treatment of chronic osteomyelitis has been demonstrated to lead to healing of a permanent nature. The patient in case after case has returned with an exacerbation, months or even years after apparently complete healing had occurred.

Examination of the roentgenograms of bones of patients treated in the manner described reveals, even in the period of quiescence, areas of rarefaction highly suggestive of bone abscesses, areas of gross irregularity, and areas of markedly increased radiopacity. Such pictures imply quiescence rather than a true return to normal function and architecture.

Lucite is particularly useful for prolonged drainage because of its nonirritating qualities and the fact that it can be molded and bent at will when immersed in boiling water; it is difficult, though not impossible, to break it. Sterilization caused some difficulty at first. The material loses shape if boiled, and phenol and alcohol render the surface rough and gummy. Aqueous metaphen solution proved to be satisfactory. In each case a plaster cast was applied so as to leave a wide margin to facilitate change of dressings without contamination. As soon as healing of the soft tissues had occurred, i.e., in about two weeks, the plaster was removed, and full activity was allowed. Daily irrigation with Dakin's solution was employed to keep the drains open in most of the cases.

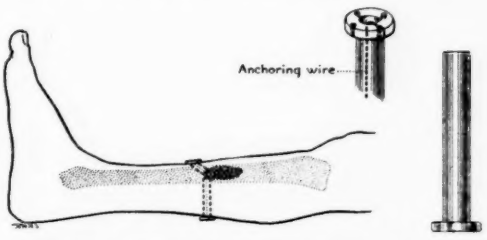


Fig. 1. The lucite drain. It is 1 cm. in external diameter and 7 mm. internally; it is of varying lengths. There is a flange 18 mm. in diameter at one end, in which holes are drilled. The drains are inserted in such fashion as to allow dependent drainage of osteomyelitic cavities regardless of whether the patient is in the recumbent or the upright position. The flange of the anterior drain is bent to be parallel with the skin. A stainless steel wire passes through both drains and the leg, and is anchored to each flange.

Twelve lesions in 11 patients have been treated in this fashion. In general, one or two drains were placed in each bone pocket. A striking relief of the discomfort and ache of chronic osteomyelitis has been observed after proper placement of these plastic drains. In most of the cases, return to normal activity has been demanded by the patient, and no ill effect from this has been recognized. Apparently complete healing occurred in 6 of the lesions, failure resulted in 2, and 3 are still under treatment. In the author's opinion, therefore, long-continued dependent drainage is the form of treatment which best restores the normal bony architecture and may best be expected to achieve a permanent cure.

This method of therapy seems best adapted to superficial long bones, particularly the tibia. This is the bone in which saucerization, sulfathiazole implantation, and primary closure are most difficult because of the inadequacy of soft tissues for obliteration of the resulting dead space. It is likely that judicious choice between the two methods in specific cases will offer the best over-all results.

ROBERT P. MONTGOMERY, M.D.

Lucas, L. S., and Davis, H. E.: Substitution Operation for Opponens Paralysis of the Thumb. Modification of the Royle Technique. *West. J. Surg.*, 1943, 51: 240.

Another modification of the Royle operation is described and illustrated. As in the original operation, the flexor sublimis digitorum tendon of the fourth finger is severed close to its insertion. This is done through a small transverse incision at the base of the ring finger.

A transverse incision is made at the flexor crease of the wrist and the same tendon is identified and pulled out through its sheath.

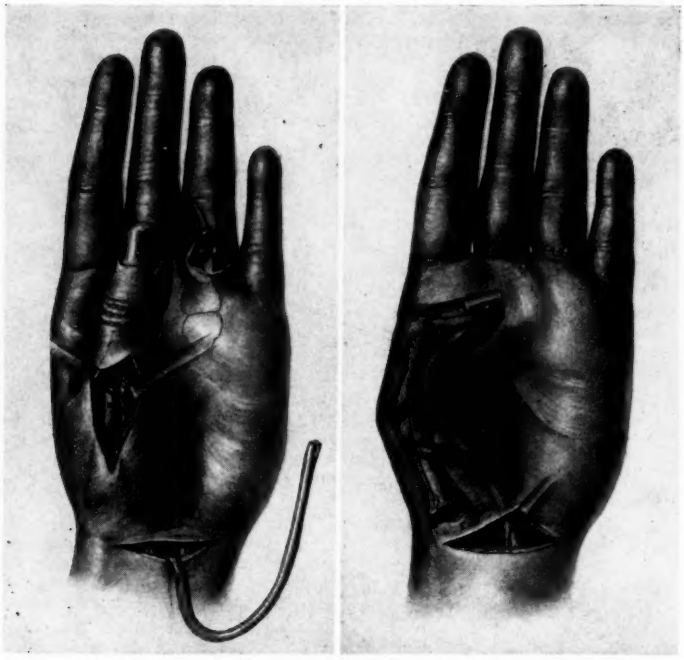


Fig. 1. Left, Shows flexor sublimis to the fourth finger cut and pulled upward through the volar incision. A hole is drilled from above through the distal end of the metacarpal of the thumb.

Fig. 2. The tendon is threaded with the flexor sheath of the flexor pollicis or through a hole in the metacarpal and sutured to itself.

A third incision is made over the anterior mesial aspect of the first metacarpal bone of the thumb, down to the periosteum which is retracted. A drill hole is made in the anteroposterior direction near the distal end of the first metacarpal.

The sheath of the flexor pollicis longus tendon is identified and opened at the level of the drill hole. An alligator forceps is passed upward through the sheath emerging through the wrist incision, where the flexor sublimis tendon end is grasped and drawn distally. The transplanted tendon is carried through the drill hole from the dorsum to the palmar surface and secured to itself by fine chromic catgut with the thumb in the position of mid-opposition. The thumb is immobilized by a metal splint for two weeks.

Eight cases have been operated upon by the author with excellent results in 7, the 1 failure being attributed to inadequate strength of the transplanted tendon. DANIEL H. LEVINTHAL, M.D.

Albee, F. H.: A New Operation for the Repair of the Crucial Ligaments of the Knee. *Am. J. Surg.*, 1943, 60: 349.

The author describes a new operation which has been used successfully on a series of 9 cases with good results. Divided anterior or posterior, or both, crucial ligaments are treated equally well.

No patient was operated upon who did not show marked anteroposterior laxity. In replacement of the crucial ligament the attachment of the new ligament should be relatively anterior on the lower end of the femur and posterior on the head of the tibia.

The operation is performed through a midline vertical incision of the patella with a bloodless field. A 3/8 in. drill hole is made obliquely through the outer condyle of the femur to a point in the intercondylar notch, well anteriorly. A drill hole of the same size is then made through the outer anterior portion of the tibia to a point near the insertion of the crucial ligaments, well posteriorly if the tibial head luxates backward, or anteriorly if it luxates forward. A portion of the fascia lata of the thigh, 7 in. in length and 1½ in. in width, is then removed.

The leg is straightened and the fascial graft is firmly keyed into the tibial hole and the femoral hole by means of bone-graft wedges. The leg is then immobilized at from 5 to 10 degrees of flexion in a plaster-of-Paris cast for two weeks, after which the knee is mobilized by physiotherapy.

RICHARD J. BENNETT, JR., M.D.

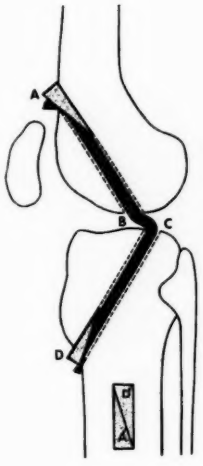


Fig. 1.

Fig. 1. This diagram discloses the general scheme of the operation. The black indicates the fascia lata extending through the drill holes into the condyles of the femur and the head of the tibia and traversing the joint at B. Extreme tension at B and C is firmly held by bone-graft keys at A and D, which are obtained from the head of the tibia at A and D.

Fig. 2. This diagram shows a 3/8 in. drill penetrating the condyles of the femur, with its exit at the intracondylar notch.

Fig. 3. This diagram indicates a drill of the same size as mentioned in Figure 2, penetrating the plateau of the tibia markedly posteriorly.

Fig. 4. This diagram indicates the obtaining of the bone-graft key wedges (with the motor saw) from the upper end of the anterior internal surface of the tibia.

Fig. 5. This diagram indicates the fascia lata (which has been obtained from the upper portion of the thigh) in place in the drill holes in the tibia and femur. (Courtesy of American Journal of Surgery.)

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

FRACTURES AND DISLOCATIONS

Platt, H.: Congenital Dislocation of the Hip. *Brit. J. Surg.*, 1943, 30: 291.

The basis for the following report is 349 patients with 447 congenital dislocations of the hips. The reduction of a congenital hip dislocation by manipulation followed by a period of fixation in plaster-of-Paris is still the method of choice, except in the dislocations discovered in the young infant before the stage of walking. There is absolute need for gentleness, and a manipulation should not be attempted in children well beyond the so-called favorable age period, nor in those dislocations in young children in which there is reason to believe there are formidable anatomical obstacles to the reposition of the femoral head in the rudimentary socket.

One hundred and four patients presenting 133 affected hip joints were examined five years and later after reduction. Fifty with 82 involved hip joints were examined ten years or more following reduction. Forty-six of 62 hip joints showed good or excellent function, but only 29 of them showed a good or satisfactory anatomical result. Both the five-year and ten-year results confirm the well established fact that the highest quality of anatomical and functional results are seen in the young children treated well within the limits of the favorable age period. At the same time, a number of surprisingly good results have been observed in older children. The author finds no convincing evidence of any general tendency to progressive deterioration in function during the years of growth as noted by Leveuf and Schede. The quality of the results recorded at the end of the first five-year period show little or no change in the same patients five years later.

The extrinsic causes of failure and disappointing results, such as, a poor selection of cases, choice of the wrong method of treatment, lack of familiarity with the manipulative technique, and inadequate or inefficient after-treatment, are for the most part avoidable.

There are intrinsic defects in structure and in capacity for growth which may determine success or failure. Anomalies of the joint capsule—attachment of the capsule to the femoral head, adherence of the capsule to the socket floor, an abnormally developed limbus, and the isthmus or hourglass contraction—may prevent reposition of the femoral head into the socket. Certain skeletal anomalies must also be considered:

1. Excessive anteversion of the femoral neck has often been cited as a factor opposing reduction, or as a cause of redislocation, and operative procedures have been devised for its correction. However, this view has found little sustained support.

2. A more important factor is the failure of the socket roof to develop and fully contain the replaced femoral head. The uncertain behavior of the acetabular roof is well recognized, but it is unwise to assume at too early a stage in treatment that failure is inevitable.

3. More important still is the uncommon complication of osteochondritis, that remarkable growth disturbance which leads to permanent and often severe deformation of the femoral head, neck, and hip socket—coxa plana and coxa vara. Osteochrondritis is not necessarily due to injury; it has been observed after easy reductions in young children, and in some cases the very early changes in the femoral epiphysis have been detected in the roentgenographs taken before reduction. The cause is obscure. Osteochondritis should be suspected if after the stage of plaster fixation the reduced hip exhibits persistent muscle spasm with or without pain. The recognition of this important complication calls for the postponement of weight bearing, and complete rest with traction is often desirable during the stage when the hip is irritable.

Spontaneous correction of residual subluxation following reduction is uncommon and active therapy is indicated. The choice lies between a further manipulative reduction followed by a short period of fixation in plaster in the standard position of 90 degrees abduction-flexion; a period of traction in abduction; or a direct operative attack on the intrinsic socket defect, i.e., the construction of an acetabular lip or shelf. In the young child conservative procedures should first be tried in the hope that the stimulus of the concentrically replaced head will cause the acetabulum to display a latent capacity for reconstruction. The shelf operation, attractive in theory but difficult in execution, has been practiced far too indiscriminately. Many shelf operations are, in the author's judgment, of pictorial value only—merely anatomical exercises in one plane. The author is not convinced that a shelf which merely prolongs a sloping roof over an eccentrically placed head contributes materially to the stability or function of the hip. The same criticism is applicable to the construction of a shelf over an unreduced dislocation, which a number of eminent authorities continue to regard as a sound procedure. The essential basis of the shelf operation is that the socket roof should be lowered over a concentrically replaced head. This is a formidable undertaking in the young child, and there is the risk of interference with future acetabular growth. In subluxations in older children it may be necessary to open the joint capsule in order to reduce the head completely. The operation then comes into the category of late open reduction.

The shelf operation also has a limited place in the treatment of primary subluxations in older children or in the young adult. However, for residual subluxations it is at best a makeshift, which in due course will tend to disappear from our repertoire as we learn to achieve a greater proportion of concentric and stable reductions.

The 42 open reductions in the author's series have been performed at different age periods, and on joints both favorable and unfavorable. They include a few cases which have been followed up over a long period, and in which the hips so far have withstood

the stresses of activity without signs of deterioration. The author's experience leads him to conclude that open reduction has an established place in the treatment of congenital dislocation of the hip, and that the indications for its use are:

1. Certain dislocations in young children during the favorable age period, when there is evidence that the intrinsic obstacles to reduction are formidable.
2. Dislocations in older children beyond the favorable age period when closed reduction is obviously impracticable or too dangerous.
3. Residual subluxations following closed reduction in older children.

It will be agreed that good anatomical and functional results cannot be guaranteed in hip joints already damaged by repeated unsuccessful efforts to reduce the dislocation by manipulation. A considerable proportion of hips are stable immediately after the head is reduced and the addition of a shelf is often unnecessary.

The after-treatment is important in determining ultimate success. A short period of fixation in plaster (eight or ten weeks) in the position of 90 degrees abduction-flexion (sometimes with internal rotation) is desirable. After this the hip is gradually brought down by continuous traction, and the stage of mobilization then begins. Weight bearing should be postponed until there is roentgenographic evidence that no growth disturbance has been set up in the femoral head or socket.

The treatment of the dislocation in the young infant involves the use of the divaricator, upon which the baby is fixed and from which it is removed at regular times for bathing and nursing purposes. The apparatus was used in 13 cases; 1, a primative luxation, resulted in complete failure and later defied all attempts at reduction by manipulation. In 4 cases the divaricator was abandoned for reasons of inconvenience after a trial of some weeks, and the dislocations were later reduced by gentle manipulation under anesthesia, followed by the usual fixation in plaster. In the remaining 8 cases the method has been most satisfactory.

In the Bologna series of 777 dislocations in infants under the age of one year that had been treated by this method of gradual abduction, 94 per cent of the cases showed excellent or perfect anatomical and functional results. ROBERT P. MONTGOMERY, M.D.

ORTHOPEDICS IN GENERAL

Galbiati, R. E.: Osseous Phosphatase in Surgical Tuberculosis (La fosfatasa ósea en las tuberculosis quirúrgicas). *Bol. Soc. cir. Rosario*, 1942, 9: 390.

The author studied the phosphorus metabolism in osseous tuberculosis, especially in cases with specific osteoarthritis. In some cases caseous, destructive forms dominated the picture, while in others a productive type prevailed. Causes of error, such as anemia, biliary retention, and hepatic insufficiency, were taken in consideration because they may influence the phosphatase contents of the blood. Anemia may provoke a hyperactivity of the blood-forming tissues, with a resulting excessive amount of phosphatase. In pulmonary tuberculosis an abnormally large amount of phosphatase is not infrequently found and gives a bad prognosis.

Osseous tuberculosis is a manifestation of the second phase of tuberculosis, caused by allergy.

Phosphatase is able to cause hydrolysis of the salts of glycerophosphatic acid. Phosphatase may liberate phosphates from organic phosphorus compounds and cause a precipitation of calcium salts.

Phosphatase is found under normal conditions in the prostatic gland, also in its epitheliomas, and in bone metastases of prostatic tumors.

The author used Bodansky's technique in determining the phosphatase contents of the blood. He noticed close relations between the amounts of calcium and of phosphatase in the blood. As a rule, a hypercalcemia is accompanied by an abnormally large amount of phosphatase.

Determinations were made in 8 cases, comprising Pott's disease, coxalgia, and tuberculosis of the spina iliaca anteroinferior. In all cases the amount of phosphatase was increased from 2 to 7 mgm. per cent.

JOSEPH K. NARAT, M.D.

Lewis, R. W.: Post-Traumatic Necrosis of Bone. *Am. J. Roentg.*, 1943, 49: 593.

Phemister calls attention to the fact that, especially in adults, interruption of circulation in the bone of an epiphysis causes serious interference with the nutrition of the articular cartilage. He states that function hastens to some extent the rate and the extent of the repair, but he cautions that function should be limited well within the strength of the necrotic bone and of the newly forming bone during the major part of the period of creeping substitution. Otherwise, fractures and more or less collapse of the articular portions may occur, with damage to the articular cartilage. If circulation of the cartilage is not restored, and it dies and becomes eroded, a chronic deforming arthritis is usually established. Post-traumatic aseptic bone necrosis is encountered rather frequently in an active bone and joint service. The most frequent site of occurrence appears to be the upper extremity of the femur, then the carpal bones, tarsal bones and ankle, and elbow, in the order of frequency.

The importance of recognizing the roentgen manifestations of circulatory disturbance in bone is obvious. Diruing the period of bone necrosis and creeping replacement, the strength of the bone is greatly diminished, and it cannot perform full function without danger of collapse and without danger of destruction of the anemic overlying articular cartilage. If these things occur, secondary osteoarthritis and a permanently damaged joint seem inevitable. If, on the other hand, the roentgenologist recognizes the existence of a deficient blood supply, and the clinician protects the part and restricts function within safe limits, or perhaps carries out some operative procedure to improve the circu-

lation, the chances of eventual re-establishment of an adequate cirulation and restoration of the part to good function are greatly increased. Roentgenograms showing post-traumatic necrotic changes in bone and changes simulating them in a case of proved Gaucher's disease are presented.

ROBERT P. MONTGOMERY, M.D.

Hanflig, S. S.: Pain in the Shoulder Girdle, Arm, and Precordium Due to Foraminal Compression of the Nerve Roots. *Arch Surg.*, 1943, 46: 652.

Radicular pain originating in the cervical spine may be due to nerve compression in the intervertebral foramina. This results from narrowing of the foramen due to a variety of causes, such as degenerative changes and collapse of the intervertebral discs, arthritic changes with or without spur formations, and chronic trauma due to malalignment and postural strain. Symptoms must be the result of a narrowing of the foramen accompanied by an inflammatory reaction, because traction can only temporarily increase the size of the foramen, and the permanent relief obtained must be due to the subsidence of a neuritis which has resulted from friction of the nerve in the narrowed foramen.

The clinical picture is of pain referred from the lower cervical region to the top and back of the shoulder, the outer border of the arm, forearm, hand or fingers, and the precordium. The thumb and index fingers are most commonly affected, often with paresthesias and numbness. Pain is increased by coughing, sneezing, or defecation; is often severe; and is worse when the patient is recumbent. The diagnosis is made after a careful history and examination, roentgen studies with oblique views which define the foramen, the exclusion of other lesions, and the relief from suspension traction on the head. The relief is best obtained with the patient sitting and enough traction for a few minutes to lift the buttocks from the seat. If the pain is due to foraminal compression of a nerve root there should be rapid relief and recurrence when the traction is released. Relief may not be obtained at the first stretching. If relief is obtained treatment is continued by short periods of stretching two or three times a day for several days. It may be applied to the patient in bed with the head of the bed suitably elevated. Heat and massage of the neck are also helpful.

The differential diagnosis of this condition is generally not difficult. Shoulder-joint lesions are aggravated by movements of the shoulder; foraminal nerve compression is aggravated by movements of the head and neck. The cervical-rib syndrome is seen in younger patients (under thirty-five years) and traction on the head makes the pain worse. It is relieved by the wearing of an airplane splint which has no effect on foraminal nerve-compression pain. The scalenus-anticus syndrome is rare and resembles the symptoms of cervical rib. Ruptured intervertebral disc and neurofibroma of a cervical nerve root may be difficult to differentiate except by means of iodized-oil injections or exploratory operations.

Paralysis of the serratus anterior muscle is diagnosed by the winging of the scapula, and it responds to the application of an airplane splint. Postural cervical sprain and the pain from hypertrophic arthritis of the spine are not accentuated by coughing or sneezing. The latter is not permanently relieved by stretching of the neck. A neurosis must be considered and may be benefited by overhead traction. True angina is associated with electrocardiographic findings and evidence of cardiac embarrassment on exertion, and the pain is usually referred down the inner aspect of the arm. CHESTER C. GUY, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Lehmann, J.: Thrombosis. Treatment and Prevention with Methylene-bis-(Hydroxycoumarin). *Lancet*, Lond., 1943, 244: 611.

Lehmann treated 100 cases of thrombosis with methylene-bis-(hydroxycoumarin) given by mouth in initial doses of 0.5 gm. and in maintenance doses of from 0.25 gm. to 0.5 gm., according to the prothrombin index (which it is desired to keep within the lower limits of 20–60). The cases included 100 with involvement of the lower extremities, and in about half the treatment was combined with active movements of the leg. The effect of the antiprothrombin treatment was estimated by noting the period between the beginning of treatment and the time when the leg was flaccid and most of the swelling had disappeared. The mean time for recovery ranged from one to three weeks, as compared with a mean time of from five to eight weeks before hydroxycoumarin was used. Lehmann believes active movements shorten the time for recovery significantly. In 2 cases embolism occurred during treatment. All of the patients survived. In 32 patients with thrombophlebitis, who received the same treatment as the 100 thrombotic patients, the mean recovery time was six and one-half days. No difference was found between the groups treated with and those treated without movements. Hydroxycoumarin combined with sulfathiazole had no better effect than hydroxycoumarin alone. In 4 cases a spreading of the process was seen during treatment. A recurrence was seen in 1 case after a period of fourteen days.

A 0.5 gm. dose of hydroxycoumarin and subsequent 0.25 gm. doses as needed to effect a prothrombin index of 30–60 were given prophylactically to 170 patients after various gynecological operations. Only 1 case of venous thrombosis and 1 mild case of embolism were seen, and there were no deaths from these causes. In the year previous there had been 9 cases of thrombosis and 5 of embolism with 3 deaths, in a comparable series. Hemorrhage occurred as a complication in about 1 case in 10, but in only 1 in 100 was it at all profuse.

The author lists the following conditions as contraindications to hydroxycoumarin treatment:

1. Diseases associated with hemorrhage. The menstrual flow was not increased, however, provided the prothrombin index remained above 30.
2. Heart diseases with symptoms of decompensation, severe myocardial degeneration, or a blood-pressure above 200 mm. of mercury.
3. Pregnancy and the first three to five days of the puerperium.
4. Severe albuminuria.
5. Nephritis, enterocolitis and hepatitis.

EDWIN J. PULASKI, M.D.

Miley, G.: Control of Acute Thrombophlebitis with Ultraviolet Blood Irradiation Therapy. *Am. J. Surg.*, 1943, 60: 354.

The Knott technique of ultraviolet blood irradiation therapy is used upon citrated blood of patients with acute thrombophlebitis. Brief abstracts of typical case histories are presented. Thirteen cases are analyzed and the results presented.

About 200 cc. of each patient's blood was irradiated. The pain usually disappeared sometime during the first twelve hours following ultraviolet blood irradiation therapy. Tenderness along the course of the affected vein usually disappeared completely in from two to six hours after the subsidence of the pain. Fever, if present, was found to drop to a normal temperature in twenty-four to forty-eight hours. Edema was the last symptom to disappear and this required from twenty-four hours to ten days.

Theoretical consequences are discussed. In this group were 5 cases which did not respond to the sulfa drugs plus local heat, bed rest, and elevation of the affected extremity. Four cases received only ultraviolet blood irradiation therapy and bed rest. Three had failed to respond to local heat, bed rest, and elevation of the affected extremity. One case failed to respond in fifty days to four therapeutic nerve blocks. All 13 cases responded to ultraviolet blood irradiation therapy.

RICHARD J. BENNETT, JR., M.D.

Lesser, A.: Embolic Arterial Occlusion of the Lower Extremities, with a Report of 4 Successful Embolectomies and a Review of the Literature. *J. Am. M. Ass.*, 1943, 122: 285.

The author notes that the early recognition and operative treatment of embolic arterial occlusion of the extremities are still relatively infrequent. He reports his recent observations in 4 successful embolectomies of his own together with a review of arterial embolism of the extremities. The etiology of arterial embolus in the systemic circulation is described in some detail. The most frequent cause is a mural thrombus in the left auricle or left ventricle of the heart. The symptoms of sudden arterial occlusion are extremely variable and multiple. Severe pain is not always characteristic, and the tendency to look for pain as the chief manifestation of embolism is probably responsible for the frequent failures to recognize the condition early. Other characteristics of the findings are absence of the peripheral pulses, a waxy whiteness or blotchy cyanosis of the skin, palpable coldness of the limb, impaired sensation, diminished reflexes, and variable degrees of motor paralysis of the limb.

The prime requisite to proper therapy in acute arterial embolism of the extremities is a constant awareness of the possibility of such an accident by

those treating patients with heart disease, which enables prompt, early recognition of the condition. The immediate measures to be taken in every early case are three-fold: (1) relief of the arterial spasm, (2) slowing of the blood-clotting time to minimize intravascular thrombosis, and (3) prompt operative embolectomy if a trial of conservative medical therapy has not restored the circulation. In the opinion of the author, conservative measures may be tried for from four to six hours after occurrence of the embolic occlusion. If after this time such measures have not caused prompt restoration of the circulation, immediate operative embolectomy should be performed. The technique of the operation of embolectomy is described in detail.

In conclusion the author notes that a survey of the recent literature reveals that emphasis is laid on prompt operative intervention as it offers a good prognosis for a live limb and a live patient.

Of those patients not receiving the benefit of embolectomy, about 90 per cent die within two weeks, whether amputation is performed or not. Patients under treatment for chronic cardiovascular disease should be constantly observed for the possibility of an acute embolic occlusion of the extremities.

Arterial embolectomy of the extremities is a simple, safe operative procedure performed under local anesthesia, with no mortality rate per se. The introduction of heparin therapy has remarkably facilitated the surgery of embolism and has minimized the danger of recurrent thrombosis.

The attempts at conservative treatment of acute embolic occlusion should not be prolonged beyond six hours after occurrence of the accident; if these measures are unsuccessful after a six-hour trial, immediate surgery should be performed.

Of the 4 successful embolectomies reported, 2 were performed on 1 patient for 2 separate embolic accidents. The number of hours which elapsed between the onset of embolic arterial occlusion and the time of the operation were, respectively, four and one-half hours, twelve hours, fourteen hours, and thirteen hours. HERBERT F. THURSTON, M.D.

Goodman, C.: Blood-Vessel Suture; Its Use Instead of the Ligature in War Surgery. *Am. J. Surg.*, 1943, 60: 196.

The author advocates the employment of blood-vessel suture rather than ligature for vascular injuries, and describes his experiences with vessel suture in World War I, in civilian practice, and in animal experiments. Numerous photomicrographs illustrate the smooth endothelial restoration which can be obtained at the site of suture in spite of the scar in the outer vessel coats. The advantage of suture over ligature is in the restoration of circulation in the limb, which obviates the dangers of gangrene and the tendency toward gas-bacillus infection. Ligation of the main vessel of an extremity when not followed by gangrene, results almost invariably in neurovascular disturbances which may be disabling. These late complications as well as the potential danger of aneurysm may be avoided by suture. If the suture does not prove entirely successful and thrombosis follows, occlusion usually occurs so slowly that ample time is afforded for adequate collateral circulation to develop.

The technique for repair of various types of vascular wounds is described and illustrated, and the important factors in preventing thrombosis are described. A bloodless field with thorough washing away of all clots from the segment to be repaired, and the removal of the adventitia from the edges of the wound are emphasized. The author believes that the more or less exsanguinated victim of a vascular injury is in need of transfusion rather than of anticoagulants, and he does not believe that heparin is of value in the severely wounded requiring blood-vessel suture. When the severed ends of a vessel cannot be approximated because of loss of substance, a paraffined Tuffier tube may be interposed. The tube may gradually become filled with soft clot but collateral circulation has ample time to develop in the meanwhile. Under favorable circumstances a segment of saphenous vein can be transplanted with the aid of a bipolar circular suture.

Statistics comparing the results of vascular suture to those of obliterating ligature, gathered from the work of surgeons for the Central Powers during World War I, are tabulated. These show that gangrene followed ligature in 10.5 per cent of the cases, while it was observed following suture in only 3 per cent of the cases. The simplified technique of Carrel should be used more frequently by our army surgeons. JOHN L. LINDQUIST, M.D.

BLOOD; TRANSFUSION

Dameshek, W., and Levine, P.: Isoimmunization with the Rh Factor in Acquired Hemolytic Anemia. *N. England J. M.*, 1943, 228: 641.

A case of acquired hemolytic anemia in which an anti-Rh agglutinin developed and repeated transfusions resulted in extreme and almost fatal hemolytic reactions is reported. Subsequent analysis of the patient's and donors' blood revealed that the patient (Group O, Rh−) had become immunized by Rh agglutinogen as evidenced by the presence in the patient's serum of anti-Rh agglutinins. Splenectomy revealed intense myeloid metaplasia, and biopsy of the liver showed an extreme erythroblastic reaction, which suggested the histological picture of erythroblastosis fetalis. Shortly after splenectomy the patient died of acute toxic necrosis of the liver.

This case illustrates the development of isoimmunization following repeated transfusions. Two different methods of isoimmunization are possible: isoimmunization of an Rh− recipient by repeated transfusions with Rh+ blood; and isoimmunization of an Rh− mother by Rh+ red cells from the fetus in utero via the placenta. The data in this case demonstrate the former.

As a practical application the recommendation is made that in cases in which isoimmunization is

suspected the modified compatibility test be performed. This consists of incubation of a mixture of the patient's serum and the donor's cells (Group O or the same group as the patient) at 37° C. for 30 minutes, followed by light centrifugation and resuspension of the sedimented cells. Under these conditions distinct specific reactions are readily obtained with any serum having warm atypical agglutinins. Furthermore, the less important reactions of the cold agglutinins can be differentiated. By this method it was possible to carry out successful transfusions with Rh— blood in the present case.

The inadvisability of giving repeated transfusions in a case of acute hemolytic anemia is well exhibited in this case. The authors believe that if several transfusions of blood have no effect on the hemolytic process, other transfusions will also probably be ineffective, and the advisability of splenectomy should be considered immediately, lest the hemolytic process become permanent or the patient have such severe reactions that splenectomy might become unwise or ineffective. JOHN L. LINDQUIST, M.D.

Cahan, A.: Hemorrhage and Purpura Caused by Dicoumarin. *N. England J. M.*, 1943, 228: 820.

A fifty-year-old woman, weighing 137 lb., entered the hospital with the complaint of weakness and progressively increasing painless hematuria of one month's duration. There was no history of any other bleeding, purpura, or jaundice. Two days before admission, purpuric patches appeared on both upper extremities and bleeding from the gums started. The patient appeared anxious and pallid. Her pulse was 112 and thready, and the rectal temperature was 100° F. Blood oozed from the gingival margins of the gums and dripped from the upper teeth. The patient expectorated numerous pea-sized blood clots. There was no epistaxis.

Purpuric manifestations, which appeared only on the extremities, were bilateral, and occurred as bluish raised areas covering the entire dorsum and proximal phalanges of both hands, as round patches 2.5 cm. in diameter over each styloid process, and as blue-black subcutaneous areas 5 cm. in diameter over the flexor and extensor surfaces of both elbows. The urine was frankly bloody with innumerable red cells per low-power field.

Venous blood examined shortly after its collection in Wintrobe's oxalate mixture revealed the following counts: red cells 2,620,000; Sahli hemoglobin 50 per cent (7.25 gm.); and white cells 8,300, with 4 per cent lymphocytes. Platelets numbered 370,000 per cu. mm. The clotting time (Lee & White) was sixteen minutes and clot retraction appeared normal within a few hours. The bleeding time (Duke) was thirteen minutes. The capillary-fragility test with the blood-pressure cuff maintained midway between the systolic and diastolic pressure was negative. The prothrombin percentage was 19. Hematocrit findings were 26 cc. of cells per 100 cc. of blood. The bone-marrow smear showed no specific changes. The positive findings were prolonged bleeding time, increased coagulation time, and marked prothrombin deficiency, associated with purpura and bleeding from the gums.

The blood could not be matched because of microscopic agglutination; therefore the patient was transfused with 250 cc. of citrated banked blood plasma without any untoward reaction. Twelve hours following this transfusion, bleeding from the gums ceased and no new purpuric patches appeared.

Further investigation revealed that the patient had received dicoumarin in almost daily doses of 100 mgm. During the thirty-two days prior to hospitalization, a total of 2,800 mgm. had been administered.

The dicoumarin had been instituted two weeks postoperatively, subsequent to the occurrence of fever and chills which had been ascribed to the occurrence of embolization following a hysterectomy, repair of a cystocele and rectocele, and a hemorrhoidectomy at another hospital thirty-two days prior to the present admission. Hematuria, which first appeared after repeated catheterization, was first noted prior to the administration of dicoumarin and persisted with increasing severity until eight days after withdrawal of the drug. Subsequent transfusions were given during the present admission with reaction to the first three 500 cc. transfusions.

The bleeding is ascribed to the development of severe hypoprothrombinemia, and in this case 20 appeared to be the critical level. However, the findings suggest another factor, since the prothrombin percentage was only 24 when the bleeding time had fallen to one minute and the purpuric and hemorrhage activity had been quiescent for four days. It is suggested that dicoumarin toxicity induces not only a hypoprothrombinemia, but also an increased sensitivity of the vascular bed to trauma. A needle-puncture tourniquet test to elicit sensitivity of the vascular bed to trauma is described.

LEROY J. KLEINSASSER, M.D.

Hurd, R. W., and Jacox, R. F.: Thrombopenic Purpura Developing as a Complication of Sulfathiazole and Sulfadiazine Therapy. *J. Am. M. Ass.*, 1943, 122: 296.

This is a report of 2 cases of thrombopenic purpura which developed as a complication of therapy with sulfonamide compounds, and a review of the pertinent literature.

The first patient, a 61-year-old man, had a severe thrombopenic hemorrhagic state during the administration of sulfathiazole. He received a total of 14 gm. by mouth during a thirty-six-hour period and at the same time had a severe pneumonic infection with a positive blood culture. He was also given rabbit serum and had a severe attack of serum sickness. However, after complete recovery, he was again shown to be sensitive both to sulfathiazole and sulfadiazine. His sensitivity to sulfathiazole was stronger than that to sulfadiazine.

The second patient, a seventy-nine-year-old woman, developed, in the course of pneumonic infection,

a fatal thrombopenic hemorrhagic state during the administration of sulfadiazine. Although she had no bacteriemia it is improbable that sulfadiazine was the only cause of the thrombopenia as her general toxicity may have played an important part as the causative element of her fatal thrombopenic hemorrhagic state.

In view of the definite demonstration of sensitivity to the drug in the first case two months after the first reaction to it, the authors believe that extreme caution should be used in the readministration of sulfa drugs following the development of thrombopenia. CONRAD L. PIRANI, M.D.

Broom, J. C., and Brown, H. C.: Abnormal Agglutination Reactions of a Strain of Leptospira Icterohaemorrhagiae. *Brit. M. J.*, 1943, 1: 783.

The diagnosis of Weil's disease (spirochetal jaundice) is made on the basis of contact of the patient with rats, by vocation, or chance; by the polymorphonuclear leucocytosis, and by the presence in the serum of increasing amounts of antibody to leptospira icterohaemorrhagiae. The agglutination test is generally used to detect the presence of antibodies, and the specificity has been well established, although care is needed in the choice of strain, preparation of antigenic suspension, and interpretation of results. For routine tests, Broom and Brown have employed cultures of the leptospira icterohaemorrhagiae (Jackson strain) which was isolated in 1934 from a patient suffering from Weil's disease. Cultures of this strain, grown in Fletcher's serum broth medium, and formalized to 0/2 per cent, proved satisfactory for eight years.

In the autumn of 1942, more than 70 cases of jaundice were investigated. Among these, the sera of 34 agglutinated the Jackson strain of leptospira icterohaemorrhagiae. These patients did not have Weil's disease. The "positive" sera failed to produce adhesion with the same strain, failed to agglutinate other strains of the leptospira icterohaemorrhagiae, and failed to protect guinea pigs against infection with a virulent culture of leptospira. No leptospira were seen in the deposits of the centrifuged urine. Scarification of the deposits and inoculation of blood into guinea pigs failed to produce infection. Differential blood counts made on these patients were either normal or showed a relative mononuclear increase instead of the polymorphonuclear leucocytosis characteristic of Weil's disease.

This instability was lost on further subculture and the strain apparently reverted to normal. The authors conclude, that "there must have been some additional factor present in the serum, because the sera of only a proportion of cases of jaundice produced this agglutination." Such an occurrence makes it necessary to employ cultures of more than one strain for diagnostic purposes.

The authors believe that this is an additional argument in favor of the view they have previously expressed, "That until some method of standardizing cultures of leptospira is employed, the serological diagnosis of Weil's disease should be undertaken only at laboratories where the idiosyncrasies of the antigens are well known."

EDWIN J. PULASKI, M.D.

Newhouser, L. R., and Lozner, E. L.: Practical Considerations in the Therapeutic Use of Blood Derivatives. *N. England J. M.*, 1943, 228: 671.

The authors note that with the increasing availability and use of liquid, frozen, and dried human citrated plasma and of human serum albumin, has come the realization that these blood derivatives are frequently not merely substitutes for whole blood, but therapeutic agents in their own right, each with its own indications and contraindications and each presenting its own practical problems. A review of certain of these practical considerations is presented.

Serum albumin should not be considered a substitute for plasma, and certainly not for whole blood. It represents a relatively stable concentrated solution of that fraction of the plasma proteins mainly responsible for the maintenance of the colloid osmotic pressure of the blood, and its chief advantages exist when storage or transportation space is at a premium. When space is available for the storage of dried plasma there are few, if any, indications for the use of serum albumin. The chief dangers in the use of human serum albumin arise from the fact that it represents but one of the serum proteins, that it is extremely hypertonic, and supplies practically none of the fluid that may be needed in the treatment of traumatic shock, burns, or hemorrhage. In burns, citrated plasma should follow albumin as soon as possible. In traumatic shock albumin must be considered solely as an emergency first-aid measure. If it is desired to administer a hypertonic blood derivative, as for example in hypoproteinemia, or in certain burned patients, concentrated plasma may be preferable to albumin. A concentrated solution of human serum albumin is quite stable at the moderate temperatures encountered in the temperate zone.

Liquid plasma, properly prepared and preserved, may be kept in a liquid state at room temperature in the temperate zone for at least as long as fourteen months. Although a small amount of fibrin precipitation is almost inevitable when plasma is preserved in the liquid state, this does not affect its efficacy or safety. It is imperative, however, that a filter be used in the intravenous set when the plasma is administered.

When liquid plasma, properly prepared, is frozen within twenty-four hours after preparation, it may be preserved indefinitely in storage at −20° C. without loss of any of the thermolabile constituents, such as prothrombin, complement, and antihemorrhagic factor. Directions are given for thawing properly before use.

The standard Army-Navy package of dried plasma can survive a wider range of temperature variation without denaturing or precipitating protein than can any of the other blood derivatives or forms of preservation. Precautions regarding its care and

administration are mentioned. A review of the results obtained from dried plasma prepared at the Naval Medical School has led the authors to the conclusion that the dangers from properly prepared pooled human plasma are practically nil. In their opinion neither preliminary crossmatching nor skin-testing is necessary.

Experience in this war with the use of blood derivatives in the prevention and treatment of shock due to trauma or burns has confirmed, beyond all question, the wisdom of administering an adequate amount early, preferably before the onset of symptoms of shock. From 500 to 1,000 cc. of plasma are an advisable initial dose following a severe injury or burn. In burns, an approximate but useful rule for estimating the first day's dosage is to administer 100 cc. of plasma for each 1 per cent of the body surface burned, up to a maximum of 4,000 or 5,000 cc. The use of Berkow's chart is advised for the estimation of the area involved. HERBERT F. THURSTON, M.D.

Denstedt, O. F., Osborne, D. E., Stansfield, H., and Rochlin, I.: The Survival of Preserved Erythrocytes after Transfusion. *Canad. M. Ass. J.*, 1943, 48: 477.

The capacity of preserved red cells to remain in circulation after transfusion is the only reliable criterion of their physiological worth, and the only basis on which methods of preservation can be evaluated. It is assumed, of course, that all red cells in circulation are functional and that they are removed as soon as their physiological properties are seriously impaired.

The purpose of the authors' investigation was to determine the merits of two blood-preservative mixtures—one, an unbuffered citrate-dextrose solution, and the other, a citrate-dextrose solution buffered with phosphate at pH 7.4. Both mixtures were isotonic with normal plasma. Blood can be stored in these solutions up to six weeks or two months at 4 C. with less than 1 per cent hemolysis. The buffered solution gives slightly better cell preservation during storage and favors less dense packing of cells on sedimentation.

The survival of erythrocytes after transfusion was followed in 32 mental subjects by the so-called MN method of Wiener. Specimens stored up to two months were used without any reaction. With regard to cell survival, the buffered mixture did not exhibit special merit. The results of the study indicated that cells stored up to eighteen days by either method survived as well as fresh cells after transfusion. Even with twenty-five- or thirty-day-old samples a sufficient number of cells remained in circulation for twenty or twenty-five days to warrant using such specimens when whole blood is needed and when fresher samples are not available. The efficacy of month-old blood in the emergency treatment of severe blood loss has been demonstrated repeatedly in the present war.

There is evidence that some of the transfused cells may be stored instead of being destroyed, and that they are released into the circulation again between the fifteenth and twenty-fifth days. A second and less marked rise in donor-cell count often is observed about the sixtieth day. JOSEPH K. NARAT, M.D.

SURGICAL TECHNIQUE

WAR SURGERY

Good, M.: Five Hundred Cases of Myalgia in the Army. *J. R. Army M. Corps*, 1943, 80: 237.

While textbooks seem to indicate that muscular diseases are very uncommon, the author is of the opinion that muscular diseases are very frequent. Their recognition likely has been delayed because of the fact that they give rise to referred pain. The common muscular disease in question is called myalgia. The cardinal symptom of myalgia is pain associated with disturbance of function. It may affect one or several muscles and is characterized by the following symptoms: (a) dull, aching, sometimes agonizing, pain occurring in attacks of a few minutes' duration or longer with long intervals; (b) the pain phenomena consists of two kinds, a deep pain which cannot be localized properly, and a superficial type which is localized, at least approximately, by the patient. This pain is aggravated by contraction and relieved by relaxation of the affected muscle or muscles. The painful areas, as described by the patient, are of a referred character. Paresthesic sensations, numbness and tingling, are often complained of in the hands or feet. A very frequent complaint is stiffness, and diminished or temporary loss of power in a special muscle or muscle group is often present.

The objective signs center around well defined areas in the muscle which are, as a rule, harder to the touch than the surrounding area. Pressure on these firm areas elicits a severe and extremely agonizing pain. Usually associated with an involuntary movement such as jerking of the head or shoulder, these painful myalgic spots do not coincide with the painful area complained of and are often very far removed from it. When appropriate treatment is applied to the myalgic spots only, the local pain elicited by pressure as well as the referred pain disappears.

From a clinical point of view, three different kinds of myalgia may be distinguished: (1) a rheumatic myalgia giving rise to pain referred to those parts of the body which are supposed to be subject to rheumatism; (2) a traumatic myalgia, the type in which the complaints can with certainty be traced to a recent or previous injury; and (3) an idiopathic myalgia of unknown origin and rather vaguely defined. Myalgia may also be acute or subacute, or of chronic type.

The author describes in detail the clinical features of some important myalgias, dealing at some length with a myalgia of the foot. The primary cause of rheumatic myalgias, as that of articular rheumatism, is not known. In the opinion of most clinicians, the following factors play a role as exciting causes: (1) septic foci of infection, (2) allergic conditions, (3) climatic conditions, (4) endocrine dysfunction of the thyroid and sex glands, (5) trauma, and (6) mental worries and emotional strain. An autonomic imbalance of the sympathetic nervous system as well as imbalance of electrolytes may be important contributing factors.

A rapid, effective, and permanent cure can be obtained by injecting procaine into the myalgic spots. The myalgic spots are mapped out on the skin with a blue pencil. The skin is prepared with iodine and 1 per cent procaine is injected into the spots, care being taken to infiltrate the whole myalgic area. When thorough and accurate injections are given, there is almost instantaneous relief of pain. Relaxation of the spastic muscle is evidenced by palpation, and pressure on the myalgia spot no longer elicits pain or produces a wincing involuntary jerking.

In conclusion, the author notes that myalgia is present in, and responsible for, the vast majority of patients suffering from rheumatism; it is not rarely associated with rheumatoid arthritis and osteoarthritis, and is commonly present with rheumatic fever. The malady is also responsible for a number of minor diseases which can be traced to an injury—traumatic myalgia. It is often of unknown origin and mimics visceral and nervous diseases, heart pain, neuralgia, sciatica, and the syndrome of painful feet. Based on his experiences with myalgia, the author presents the claim that rheumatism is, for practical purposes, a curable disease.

HERBERT F. THURSTON, M.D.

Brown, D. O.: Repairs of Limb Wounds by the Use of Direct Skin Flaps. *Brit. J. Surg.*, 1943, 30: 307.

Replacement of skin loss is an essential part of the restoration of function following severe injuries to the limbs. The ideal method for such replacement is by the use of local skin flaps, but in many instances wherein loss is extensive it becomes necessary to transfer skin from a distance.

The disadvantages of a free graft are several. For its survival it requires an adequate blood supply from the new base. It is not applicable over exposed bone, cartilage, or tendons. It has a constant tendency to contract, and, if used to cover a defect over a joint will result in a recurrence of deformity and limitation of motion. It provides a poor field for later operative procedures that may be necessary. Its appearance is indifferent.

The disadvantages of a full-thickness flap are: it requires at least two operations; the process of transference is frequently uncomfortable to the patient; and it may leave a large secondary defect. However, because of its better functional and cosmetic result, the author prefers the latter type of graft, and performs a direct flap transference in two operations. This is achieved by bringing the recipient area into contiguity with the donor area rather than utilizing the tubed-pedicle method involving several operations.

The direct flap method of transference is advocated for recent injuries with extensive skin loss in regions of great functional significance, and for old unhealed wounds or healed wounds with tissue loss and contracture in regions of great functional significance. In general, skin losses from the hand, forearm, or elbow are replaced by skin from the abdominal wall. Skin losses of the lower extremity are supplied by some variety of the crossed-leg method of transference.

At the first operation, the defect is established by wide excision of the wound or scar tissue so that normal skin is encountered on all sides. The flap must be designed accurately, cut properly, and sutured in place with great care. A razor graft is then applied to the donor area before immobilization. Correct postoperative fixation is essential. In the abdomen-to-forearm flaps, elastoplast is used. In the crossed-leg flaps the author prefers skin plaster for fixation.

The flap should be examined within a few hours after operation and observed at frequent intervals thereafter. Massage is started usually a few days after operation. Sutures are removed in from three to five days. Fixation is removed by the end of the second week and increasing freedom of motion is encouraged.

Bacterial cultures are advisable before division of the flap at the second operation, to be certain that no significant infection is present. After final division of the flap the donor site is closed by suture with or without grafting.

Complications of the direct skin flap method of transference are discussed and suggestions are made for their prevention. EDWARD W. GIBBS, M.D.

McKee, G. K.: The Use of Irrigation Envelopes in the Treatment of Lacerated Wounds and Compound Fractures. *Brit. J. Surg.*, 1943, 30: 328.

The Bunyan-Stannard method of treating lacerated wounds and compound fractures is a simple, efficient, and nonirritating procedure which provides frequent irrigations and inspections without disturbing the dressings. A careful wound cleansing with excision of devitalized tissue must first be done, followed by irrigations three times per day, starting within twelve hours of the initial cleansing. This appears to disturb the incubation of the microorganisms in the wound and prevents suppuration so effectively that active movements can be instituted from the first without fear of spreading the infection. In the treatment of injuries to the limbs this preservation of movement from the start is of fundamental importance.

After the toilet of the wound is completed an occlusive envelope is applied and a further irrigation with 1:5 E.S.H. solution is carried out at once to sterilize the interior of the envelope. Subsequently the wound is irrigated three times per day with a 1-20 E.S.H. solution. The irrigation fluid should always be at a temperature of 100°F., and its cleansing effect is increased by the lowering of the surface tension if a solution of sodium or ammonium lauryl (a detergent

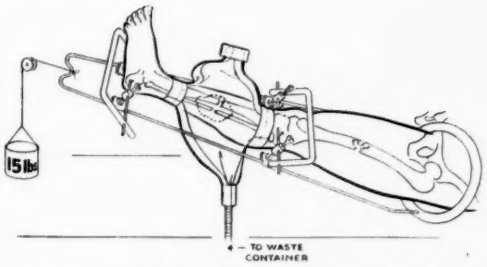


Fig. 1. This illustrates the method used for a fracture of the femur and of the tibia and fibula. It can be appreciated that the tibial fracture is fixed in the apparatus and then the control of the femoral fracture is readily obtained.

derived from coconut oil) sulfate is added, a strength of 1 drachm to 1 pint of hypochlorite having been used in this series of cases. It is advisable to use this detergent solution only for the initial cleansing of the wound and perhaps occasionally afterward if the bag becomes difficult to clean, because the repeated and prolonged use of lauryl sulfate has been found to lead to some irritation of the superficial layers of the wound and skin. The substitution of saline solution for hypochlorite solution is to be avoided.

After each irrigation the envelope must be thoroughly drained; it must not be used as a wound bath, and should be dried on each occasion by a current of warm filtered air, and the openings should be sealed. Excessive inflation must be avoided in view of possible damage to the envelope and the production of leakage. If it is necessary to control hemorrhage by pressure, it should be applied outside of the envelope, there being no need, of course, for the dressings to be sterile for this purpose.

This envelope method is simpler than Carrel's method and has three added advantages in that it protects the wounds from further outside infection, permits free movement and locomotion, and allows immediate inspection and palpation of the wounded area. It may be stated that in the present series great care was taken to adhere scrupulously to the published technique of the method.

It is an excellent method for dealing with compound fractures, provided that a suitable method of dealing with the fracture can be employed. Vitallium is to be preferred to stainless steel as there is less reaction with the electrolytic sodium hypochlorite. The plaster-of-Paris technique is not suitable, and open plating may be difficult because of the electrochemical reaction around the plate as a result of the use of an electrolyte solution. The use of Steinmann's pins, by transfixation of the fragments and then clamping of the pins to the side bars of a Thomas splint, has been found to be very suitable for fractures of the tibia and fibula and for those of the femur.

Most of the 32 cases were very severe injuries, 1 patient with multiple bullet wounds dying of gas

gangrene, but apart from this the cases were, on the whole, remarkable for the freedom from pain and absence of reaction, both general and local.

These case notes show that if there is more than a mild reaction, i.e., if the temperature rises higher than 100°F. in an adult during the first few days, drainage of the wound is inadequate, which is probably due to a faulty initial operation, or the wound was inadequately cleansed or sutured in an unsuitable manner. Such a reaction must not be allowed to continue with the hope that it will subside; it is a definite signal that active steps must be taken immediately to obtain better drainage and free irrigation of the wound.

The envelope method has been used for many other conditions; its use in the treatment of burns has been dealt with by other workers; as a first-aid method it is excellent, in the author's opinion, the apparatus being small in bulk, simple in application, and efficient in action; it should be valuable in the Services. As a method of cleaning up granulating areas with sloughs prior to skin-grafting it is also very useful, and for dealing with infections of the hand it is ideal. It has been employed in some cases of acute osteomyelitis after drainage of the abscess with satisfactory results, but the closed plaster technique has a big advantage in these cases, especially in children, since dressings are completely eliminated.

ROBERT P. MONTGOMERY, M.D.

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Weaver, D. F.: Free Skin Grafts and Pedicled Flaps in the Treatment of Recurring Basal-Cell Epitheliomas. Case Reports. *Laryngoscope*, 1943, 53: 336.

Basal-cell epitheliomas are usually slow-growing and do not metastasize; therefore their early treatment by adequate surgical measures gives good results. Equally good results have been reported from irradiation. Because of inadequate treatment some cases continue to progress and to involve underlying cartilage and bone so that wide removal by excision or diathermy becomes necessary. Deformity due to the tumor is increased by the surgery. With the use of free skin grafts or pedicled flaps the ultimate cosmetic result is usually satisfactory.

Immediately following removal of the tumor, frozen sections are made and examined and if it is reasonably certain that no tumor remains, a free skin graft may be prepared and applied at once. If bone or cartilage is involved and if electrocoagulation is necessary, the slough is allowed to separate and any sequestrum is removed. About two months is usually the optimum time for sequestrectomy. The choice of a free graft or flap depends upon a variety of factors.

Three cases are reported. In the first the tumor on the dorsum of the nose was resected along with underlying cartilage and bone, and the defect was covered successfully with a free skin graft.

In the second case the tumor was located behind the ear and extended into the lobe. It had been removed three times in eight years. A wide removal was done by coagulation and the defect was later covered with a free skin graft.

The third case was that of a tumor following injury to the forehead ten years previously. It had been excised widely on 3 occasions in eight years, with extensive irradiation after the last operation two years earlier. Wide excision and coagulation were done. Six weeks later a pedicle was prepared; it was lined by a free graft and sutured back. Two weeks later the sequestrated anterior wall of the frontal sinus was removed with the hypertrophic lining of the sinus. The pedicled flap was raised and sutured into the defect. The bed from which the flap was removed was covered with free skin grafts from the thigh. Drainage from the sinus persisted for weeks through the wound. Four months later the flap was raised. Since the sinus was filled with fibrous tissue the lining was removed from the flap so that it could then unite with the fibrous tissue in the sinus.

JOHN R. LINDSAY, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Cope, O., and Others: Management of the Cocoanut Grove Burns at the Massachusetts General Hospital (Symposium). *Ann. Surg.*, 1943, 117: 803.

THE PROBLEMS OF THE HOSPITAL ADMINISTRATION

FAXON states that 39 living patients with burns sustained in the Cocoanut Grove disaster were admitted to the Massachusetts General Hospital. The hospital organization met the emergency adequately and well. The following conclusions are drawn:

1. The hospital administration has learned the value of anticipation and preparation. The staff and personnel had been organized as teams, their duties carefully specified, information regarding disaster management spread widely, and practice mobilizations carried out. The value of having on hand what might have been considered an unnecessarily large quantity of supplies is stressed.

2. The value of a well planned telephone service to notify administration, staff, nurses, technicians, maintenance, and department heads should be especially emphasized.

3. The necessity of immediate examination and separation of the living and dead at the very entrance of the hospital was only realized after a number of dead had been sent to the Emergency Ward.

4. The organizing of teams of nurses and assistants for the undressing of patients, the affixing of identifying tags, and the care and marking of the patients' clothing and belongings is important. Those entrusted with the medical or surgical treatment of patients have no time for this, and the identification of patients separated from their clothing may be difficult. Likewise, clothing and valuables may get hopelessly mixed.

5. Special medical teams for the administration of morphine and the treatment of shock by plasma and oxygen therapy were found to be valuable.

6. Prompt examination of the dead by a medical examiner or hospital pathologist may provide clinicians with valuable data which will aid in the treatment of the living. Autopsies upon those dying after clinical appraisal of symptoms are particularly helpful.

7. An emergency morgue should be selected in advance, with attention to accessibility, isolation, windows for ventilation, and cooling. It should be at once placed in charge of some responsible person and a police guard obtained as soon as possible. The bodies should be arranged in orderly fashion, heads in the same direction, and the sexes separated, if possible; the bodies should be covered with sheets. Tags numbered consecutively bearing date and hour of arrival should be attached to the right wrist. The Medical Examiner or Coroner should be consulted as soon as possible and his directions followed. If he so directs, identification of the dead may be carried out. The name of the dead person can then be added to the tag. Also, at that time, valuables, pocketbooks, and cards may be placed in an envelope bearing the same number as the tag and attached to the left wrist. No jewelry should be removed.

However, if the Medical Examiner so directs, a complete list of all valuables can be made by two persons, one preferably a police officer, and the valuables placed in an envelope signed by the two persons, and placed in a safe.

8. A list of living casualties and a list of identified dead should be prepared as quickly as possible and sent to the Information Desk. There it should be arranged alphabetically; several typed sheets should be prepared, and the information given to the police and press. All inquiries should be directed to this Central Information Desk.

9. In a disaster of this type, in which the injuries were all of the same kind, the importance of concentration of casualties in one group in one ward or floor where they can be under concentrated medical treatment and where isolation procedures may be set up if needed, was clearly demonstrated. This concentration and this isolation prevented respiratory complications to a large degree and permitted better treatment. Doctors, nurses, equipment, and supplies were concentrated here, and were quickly available for emergency treatment. Time and labor were saved.

10. It is desirable to obtain police assistance speedily to control yard traffic and to guard the hospital corridors and morgue.

11. The serving of coffee and sandwiches by the Dietary Department and the Red Cross Canteen was valuable in sustaining the energy and morale of the workers, and in comforting waiting relatives.

12. Finally, the hospital management has learned the value of constantly maintaining, for use in peace or war, a hospital organization for the handling of emergency disasters.

SOCIAL SERVICE ACTIVITIES

CANNON informs us that The Casualty Preparedness Program at the Massachusetts General Hospital delegated to the Social Service Department several responsibilities in rendering service to the victims of the Cocoanut Grove disaster. These were:

1. Identification and registration of victims, in assistance to Hospital Admitting Officers. Reporting list of victims to Master File conducted by the Committee on Public Safety.

2. Arranging for transfer of such patients as were suitable for discharge to their own homes, convalescent or nursing homes, or other hospitals, to relieve the wards for the admission of victims.

3. Maintenance of Information and Advice Service to families and friends of victims. This was done to relieve the Hospital Information Service.

4. Liaison with Red Cross Disaster Relief in their service to victims and with Public Safety District Information and Advice Bureaus.

To get some idea of the pressure at the Information Desk, one must realize that while the doctors and nurses were absorbed in giving care to the living victims, and the Administration was wrestling with the problem of an improvised mortuary for the 75 dead, the community was being aroused to the magnitude of the tragedy by radio and swift traveling news. Families and friends were setting out anxiously to locate some 650 missing persons.

The major task of the Social Service Department at the hospital entrance was meeting and interviewing the relatives and friends of those seeking victims. Some 175 interviews were recorded. Many inquirers wanted to smoke and were not denied. They were interviewed by the Social Service Staff. For the interview, which served as some release of tension, they were seated. So far as possible, visitors were accompanied by volunteers or Social Service workers on their visit to the improvised mortuary. Medical Social Service assisted at the mortuary where all inquirers were required to register. If identification was established, the relative was accompanied to the Admitting Office. If not, the next step was suggested. The address and telephone number of the Master File and other hospitals were given.

During a disaster no services can be considered mechanical. Giving information or compiling data and making records requires a degree of judgment and skill not demanded under ordinary circumstances. Because of the extreme emotional tension under which people are suffering and the stunned sense of isolated bewilderment, instructions are often not readily comprehended. Customary routine, such as asking for information, needs to be individualized and far more skill in the interviewing is required.

On direction of the Administrator on duty, incoming mail to patients was opened and read, and wherever there was question about reading certain messages to a patient, the approval of the doctor was secured. Many patients had bandages over their faces which prevented use of their eyes, and so it

was important to read mail to them. Messages, letters, and telegrams from patients were handled by Social Service workers for them.

Practical problems distressed patients and needed attention. Among these were witnessing a will, attending to insurance papers, inquiries about clothing and valuables, transfer of automobiles left near the scene of the disaster, job adjustments, communication with employers, the writing of letters, household arrangements such as messages to maids at home, care of pets, and liaison with army and navy authorities. Discrimination was necessary in deciding what could be handled by the social worker and what needed clinical or administrative sanction.

By previous agreement one of the Social Service Staff had been appointed liaison worker with the Red Cross Disaster Relief. Although most of the patients were in comfortable economic circumstances there were some serious and urgent needs for advice and guidance in meeting the necessary adjustments, especially for families at a distance.

NEUROPSYCHIATRIC OBSERVATIONS

The studies reported by COBB and LINDEMANN do not deal with all the neuropsychiatric abnormalities which occurred on the Disaster Ward among the victims of the Cocoanut Grove conflagration. Mild transient confusions and delirious conditions, fluctuations in consciousness, and fleeting periods of restlessness were handled by surgeons and medical men without the need for special psychiatric inquiry.

The report deals rather with the problems involved in the emotional adjustment of the patient to the disaster, with all its implications—disfigurement, lasting disability, loss of work, bereavement, and disturbed social situations.

The first request for psychiatric help came through the social workers who were serving as liaison personnel with relatives and friends. They soon had become aware of the fact that the emotional upset which followed the discovery of a body had attained, in some of the relatives, the proportions of a major psychiatric condition and needed trained intervention. From observing violent reactions in the relatives, the authors concluded that similar reactions may occur in the patients on the ward as soon as they were recovered enough to deal with the disruption of their social relationships. On the eighth day after the disaster, the psychiatrists were invited to review all patients still on the ward.

Of 39 patients admitted to the hospital, 7 died within sixty-two hours. Of the survivors, at least 14 presented neuropsychiatric problems.

Unless the psychiatrist has an opportunity to see all the victims of a disaster, danger signals and opportunities for help along psychological lines may be overlooked, since they are by no means obvious to the untrained worker.

Conditions predominantly due to cerebral damage were rare, probably because they usually lead to death. Conditions predominantly due to psychogenic factors showed a high incidence. In all patients with clear-cut neuroses and psychoses, the psychiatric history offered clues as to the likelihood of such development under stress. This observation fits well with recent studies concerning traumatic neuroses in the armed forces. It seems well founded that induction boards refuse admission to the armed forces to candidates who show a former history of psychosis or psychoneurosis.

The more severe emotional disturbances encountered in formerly well adjusted patients seemed to be due not so much to the impersonal effects of the disaster (fright and horror) as to the problems in personal and social relationships involving conflict and guilt. Psychiatric assistance in the solution of these personal problems and in readjustment after a social crisis forms an important part of treatment.

The authors' observations seem to indicate that the psychiatrist can operate as a useful member of a disaster unit. His work may be divided into three phases:

In the first few days severe shock and life-saving procedures occupy the field. Apathy and excitement, confusion, and delirious states have to be managed by proper sedation and proper surroundings. The second phase deals with the psychiatric care of the convalescent patient, advice to him in his transitory problems, determination when messages should be delivered or revelations made, and managing with the patient his efforts to readjust himself. The third phase deals with the psychiatric care of the convalescent patient after he leaves the hospital and his proper readjustment in the community. We can, in this manner, have reasonable hope of preventing the occurrence of prolonged maladjustment or traumatic neurosis.

During the first phase, the psychiatrist's chief contribution is his aid to the relatives and his counsel to the medical social worker who is dealing with numerous problems of family and work relationships. During the second, he is intimately involved with the internist and surgeon and must continue his contact with the social worker. This contact becomes even more important during the third phase, when social readjustment forms the center of interest. Throughout the whole of the three periods, not the least of the psychiatrist's responsibilities is determining what can safely be delegated to the medical social worker and guiding her in her efforts.

RESUSCITATION AND SEDATION OF PATIENTS WITH BURNS WHICH INCLUDE THE AIRWAY

In the Cocoanut Grove disaster BEECHER had a unique opportunity for simultaneous observation of a considerable number (39) of victims of the same accident. It was quite apparent that pain was an improbable cause of the observed outstanding characteristic of this group, namely, hyperactivity. As time progressed the importance of correctly diagnosing the cause of this hyperactivity in a given case became increasingly clear, for proper therapy depended upon differentiating between three possible major causes:

1. Pain. Unquestionably, pain was present in many patients. This was due to burns, to irritation of the mucous membranes, chiefly of the eyes and the respiratory tract, by irritant gases, and to physical violence as a result of the panic.

2. Fear and hysteria, as a result of the individual's experiences, appeared to influence the behavior of those who had no injuries, and doubtless were also factors in the behavior of many of those with physical injuries as well.

3. Anoxia. Cerebral anoxia is well known to give rise to excitement, occasionally to loss of self-control, and at times to manic behavior. Anoxia was probably a factor in the burned patients due to two main causes:

a. Interference with the oxygen intake from obstruction of the respiratory tract. This was caused by a number of factors, for example, foreign bodies, chiefly vomitus. (This was a common hazard in the comatose but not in the hyperactive group.) Severe bronchial spasm occurred from pulmonary irritation caused by inspiration of the hot and noxious gases and probably interfered with the intake of oxygen. Edema of the airway developed into a problem beginning chiefly about four hours following the burns.

b. Impairment of oxygen transport by the blood was a factor in the development of anoxia largely as the result of the formation of carbon-monoxide hemoglobin. Neither methemoglobin formation nor hemolysis as the result of encounter with noxious gases was a factor. While acute anemia must always be considered as a cause of cerebral anoxia, neither hemorrhage from associated wounds nor low blood pressure from shock was important in these cases.

Morphine is a useful therapeutic agent only for those in the first of these three groups. In the other two groups it is not only ineffective but is contraindicated in large doses. Although large doses of morphine are often employed in treating patients injured in a conflagration, it seems probable that morphine may often have been used in an attempt to treat conditions which will not respond favorably to morphine irrespective of the size of the dose.

In patient's who have been water-soaked and chilled, who are frightened, or who are approaching shock, or in those whose peripheral circulation is otherwise greatly reduced, it is unwise to administer morphine (or other agents) subcutaneously or intramuscularly, for absorption will be either absent or greatly retarded. Lack of effect may lead to repeated administration of the agent in an effort to obtain an effect. Later, when the circulation has improved, the total of the subcutaneous injection may enter the circulation at one time with serious, even fatal consequences. Morphine should be administered intravenously to such patients. If, because of the great number of patients to be cared for, one cannot take time for the intravenous administration of morphine, the agent should be injected into an unburned extremity and the injection site marked with ink, or a dye, so that if too great absorption of the agent is apparent later on, the inflow can be checked by means of a tourniquet.

For fear and hysteria, intravenously administered barbiturates are useful. For anoxia arising chiefly from carbon-monoxide poisoning the treatment is administration of 7 per cent carbon dioxide in 93 per cent oxygen in continuous stream (without rebreathing) with the administration of whole blood.

As to the treatment of anoxia due to an inadequate airway, occasionally aspiration of the mouth and throat was carried out to prevent aspiration of vomited food. Tracheotomy was required for the first time six and one-half hours following the fire. In all, 5 tracheotomies were carried out in the 39 patients on account of a serious edema of the airway.

The bronchospasm was initiated presumably by heat or by the irritant gases breathed. It may have been a factor in precipitating or aggravating pulmonary edema formation. Attempts to treat this bronchospasm with epinephrine or ephedrine appeared to be quite unsuccessful. In a few cases the intravenous administration of 0.5 gm. (9.5 grs.) of aminophylline appeared to be followed immediately by better ventilation, and in some cases by cough, with the raising of sputum. Patients showing any signs of anoxia were immediately given (by mask) 100 per cent oxygen to breathe.

As to anoxia from inadequate transport of oxygen by the blood, many of the dead patients showed signs of carbon-monoxide poisoning, but only 2, questionably 3, of the 39 living patients showed fairly definite signs of it. In these, attempts were made to eliminate the carbon monoxide by the administration of a continuous stream of oxygen containing from 5 to 7 per cent carbon dioxide. No rebreathing was permitted.

Delayed reactions are to be anticipated. Constant alertness must be maintained for the signs of (a) overmedication, particularly in cases in which morphine may have been administered subcutaneously, with delayed absorption, as in patients with poor peripheral circulation as a result of chilling or shock: (b) shock, as a result of plasma loss from burned surfaces, or other cause; (c) oropharyngeal, tracheal, or pulmonary edema; and (d) damage of the central nervous system with delayed onset of cerebral edema and increased intracranial pressure.

THE PULMONARY COMPLICATIONS: A CLINICAL DESCRIPTION

AUB, PITTMAN, and BRUES found that many burned patients have pulmonary lesions due to thermal or chemical burns of the lung, and that an important part of burn management consists in the recognition and proper treatment of these pulmonary burns. This was particularly well emphasized in the Cocoanut Grove cases treated at the Massachusetts General Hospital, since all 7 of the deaths were due to pulmonary complications. In fact, only 3 of the 39 patients were wholly free from respiratory symptoms. Several of the more severely burned vic-

tims were delirious, and 2 of these were quieted promptly by oxygen inhalations, which suggested that the delirium was due to anoxia aggravated by carbon-monoxide poisoning and the slowing up of the respirations from morphine. About three hours after the fire, dyspnea associated with cyanosis, restlessness, and increased rales suddenly appeared in others. Since there was a rapid accumulation of edema in the external burns at this time, it is probable that burned pulmonary areas were undergoing similar changes. A more critical period occurred about twenty-four hours after the fire and continued for the next thirty-six. Dyspnea and cyanosis became much aggravated in certain patients, and rales again spread. This fulminating state was obviously due to edema from burns of the upper air passages, trachea, and bronchial tree. Laryngeal examination had demonstrated reddening, edema, and burned areas extending beyond the vocal cords. Because of the critical nature of symptoms at this time, radical therapy appeared to be indicated, and intubations and tracheotomies were done in several instances. Following subsidence of the epidemic-like attack of pulmonary edema, the final, subacute stage of pulmonary manifestations set in, of which the pathological basis was diffuse bronchiolitis. This resulted in (1) obstruction of the air passages, particularly in the bases, sufficient to produce localized lobular collapse; and (2) trapping of air at the apices with acute emphysema. Both gave characteristic physical signs; the percussion note was highly resonant over emphysematous areas, and normal or slightly dull over the small areas of collapse, while the most striking finding was the surprisingly diminished breath sounds over the entire chest, most evident in the lower portions. The absence of bronchial breathing suggested that the bronchi were plugged with secretion which prevented bronchial breath sounds from being transmitted to the periphery. The areas of acute emphysema showed the same migratory tendency as those of atelectasis and lobular collapse. The areas of collapse and of emphysema appeared to have a common origin in obstruction of the bronchioles—complete obstruction causing collapse, and partial obstruction producing emphysema.

Of the numerous lessons to be learned from these lung burns, the following should be emphasized: (1) that covering the mouth with a wet cloth may afford complete protection against pulmonary burns; (2) that in most patients the degree of inhalation burn is by no means ascertainable directly after the fire, and the extreme edema, which occurs later, cannot be predicted; and (3) that the resuscitation of patients in acute attacks of edema is difficult and unsatisfactory, and these attacks must be watched for even in patients with minimal surface burns.

ROENTGENOLOGICAL REPORT OF THE PULMONARY LESIONS

SCHATZKI states that 35 of the survivors of the Cocoanut Grove disaster were examined roentgenologically following their admittance to the hospital. Pulmonary pathology was found at some time in 22 patients, whereas the examination of the other 13 was negative at all times.

The roentgenological appearance of the lungs was bizarre and varied from patient to patient. The majority of the lesions, however, could be explained by areas of atelectasis and emphysema, both apparently due to bronchial occlusion, particularly of the smaller bronchi. Atypical lesions (miliary nodules, and areas of "drowned" lung) were seen in a few cases. Diffuse pulmonary edema was found in 2 victims who were dead on arrival. Infarcts were not recognized roentgenologically in the first period following the fire, although some may have existed. Acute dilatation of the stomach was found in 5 patients, and of the esophagus in 1 patient. The lesions of all the survivors finally disappeared except in 2 cases.

This report shows that the abnormal roentgenological appearance of the lungs in the survivors of the Cocoanut Grove disaster was caused primarily by damage to the bronchi and bronchioles. The roentgenological changes may be characterized as a classical example of diffuse damage to these parts of the upper respiratory tract. Similar roentgenological appearances may result from many other causes of widespread bronchial injury, and in the recognition of this fact lies the importance of this experience in a broader sense. In infants with bronchiolitis and peribronchiolitis, the roentgenograms show areas of atelectasis and emphysema like those described in this report. Damage to bronchioles scattered throughout the lungs from various gases or from inhalation of food or water may produce similar pathology and similar roentgenological findings. During wartime such trauma is likely to be a frequent occurrence, and early recognition of the mechanism involved will be of value in the determination of the correct treatment.

PATHOLOGY; WITH SPECIAL REFERENCE TO THE PULMONARY LESIONS

MALLORY and BRICKLEY report that postmortem examinations of 6 victims of the Cocoanut Grove conflagration in Boston were performed either at the Northern Mortuary of Suffolk County or in the Pathology Laboratory at the Massachusetts General Hospital. It was apparent from inspection of the bodies which were delivered to the hospital and to the mortuary that only a small proportion of the victims had suffered extensive enough surface burns to account for death and that a search for contributory factors was in order. The most obvious of these was carbon-monoxide poisoning, which was apparent clinically, and was confirmed at autopsy, by the finding of 42 per cent and 50 per cent saturation of the hemoglobin in samples obtained from the right heart in 2 victims who were dead on arrival. Although significant as a contributing factor, this degree of monoxide saturation could not in itself be considered lethal. The postmortem studies were entirely in

accord with early clinical impressions in emphasizing the great importance of the involvement of the respiratory tract.

All of the dead on arrival showed intense but nonnecrotizing hemorrhagic tracheitis and bronchitis, and all presented heavy voluminous lungs, from the cut surfaces of which fluid in large amount could be expressed. Microscopic examination confirmed the presence of acute pulmonary edema and demonstrated in the upper tracheobronchial tree a serohemorrhagic exudation without significant leucocytic infiltration. It was concluded that the victims had inhaled an irritant agent, either physical or chemical, that they had lived long enough to develop a serous but not a leucocytic reaction, and that, therefore, their survival period was to be measured in minutes rather than seconds or in hours. The mechanism of death was anoxemia, dependent in part upon inhalation of carbon monoxide and in all probability other gases, and in part upon edema of the lungs.

In victims who died after varying periods in the wards, the major visceral lesions were again found in the respiratory tract; all 3 showed diffuse hemorrhagic and focal membranous reaction in the lower trachea and primary bronchi.

The most characteristic feature of the material was the diffuse membranous bronchitis. This is a characteristic effect of several of the war gases, notably phosgene, mustard gas, and chloropicrin. It is also characteristic of nitrogen dioxide. Herein lies the strongest pathological evidence for inhalation of toxic fumes.

THE TREATMENT OF THE SURFACE BURNS

Cope states that 39 of the 114 patients brought to the Emergency Ward of the Massachusetts General Hospital from the Cocoanut Grove night club fire survived the initial few minutes and received treatment of their burns.

As the patients entered the Emergency Ward, either walking or on a stretcher, sterile towels were placed over the burned areas. No covering was put over their faces. Insofar as possible, these towels were held in place as the patients were undressed and transferred from stretcher to bed. For those patients who had burns of the back, buttocks, and upper legs, sterile sheets were placed on the bed. A needle was inserted for the intravenous administration of plasma before the dressings were applied to the burned surfaces. In many this was done while the patient was still on the stretcher. When a patient was settled in bed, the sterile towels were folded back and the burn surfaces covered with sterile boric-acid strips. These strips were applied by interns or medical students who were not only capped and masked but were scrubbed and wearing rubber gloves. The burn surfaces were neither cleansed nor débrided. The boric ointment gauze of fine mesh was covered with sterile gauze to protect the wounds. Burns of the face, scalp, and extremities were bandaged with pressure. This was accomplished by adding roller elastic bandages on top of the gauze dressing. Over the burns of the trunk, large stockinet rolls were applied. The dressings of burns of the neck were held in place by ordinary gauze bandages. The eyes, after application of 5 per cent sulfathiazole ointment, were closed and were included in the pressure dressings of the head. Only the nostrils and lips were left uncovered.

As a final part of the initial surface treatment, 2 gm. of sodium sulfadiazine were injected intravenously through the cannula or needle already in place for plasma transfusion.

The dressings were not changed until the fifth to tenth day, when boric ointment gauze was reapplied. To those burns which proved to be of second degree, no other type of dressing was applied. To those areas later proving to have deep destruction of the skin, wet dressings of boric acid or physiological saline solution were used after the first two weeks in order to expedite the removal of the burned tissue and prepare the surfaces for grafting.

The use of this unorthodox surface treatment was premeditated and prompted by the concept that of treatments giving approximately equal results, the simplest would be the one best adapted for a disaster with numerous burn casualties.

Cope did not débride the burn wounds because he was convinced that the intact epidermis over the blebs protects against the entrance of bacteria, and because bleb fluid does not become contaminated by virulent organisms harbored in gland crypts. He did not cleanse the burnt surfaces because he believes that cleansing is ineffectual in reducing significantly the number of contaminating organisms present unless vigorous scrubbing is done. Such scrubbing, it is believed, injures viable epithelium. An anesthetic also would be necessary and is undesirable from the point of view of augmenting shock.

Admittedly, débridement is necessary for good tanning, and, therefore, débridement and cleansing are part of the tannic-acid ritual; they have been carried over into other methods of treatment without criticism. These maneuvers are time-consuming as well as painful. They tie up available personnel and require analgesic drugs, if not general anesthetics. The increased manipulation of the patient, prolonged exposure of the wounds, and the anesthetics used with débridement are conducive to serious shock.

When nondébridement of burn wounds was suggested soon after Pearl Harbor, serious objections were raised. It was maintained that all blebs must be opened because bleb fluid would be an excellent anaerobic culture medium and because the bacteria harbored in the gland crypts at the base of the vesicle would swim up and infect the fluid. On physiological grounds the first objection seemed unreasonable: superficial human burn wounds weep for many hours. Against the second objection are the bacteriological observations of Colebrook and others, pointing to the ability of the skin to rid itself of pathogenic bacteria. There are normal habitants of the skin which are not sufficiently virulent to cause infection, and little trouble is to be expected from

these. Virulent bacteria are destroyed, perhaps by the skin lipoids. The heat producing the burn also decreased the number of bacteria present on the skin at the time. Another objection which has been raised to nondébridement is that the dead epidermis of vesicles which have already ruptured provides a culture medium for organisms. If it is excised and a dressing is applied, it will be replaced by a layer of fibrin between the cells and the dressing, and as far as is known, this inert fibrin is as good a culture medium as the dead epidermis. A major point in favor of nondébridement of the burn wound is, as has been shown in this laboratory, the availability to the wound of chemotherapeutic agents administered internally. Absorption of sulfonamides applied locally to the débrided burn surface has been reported in the literature. Such absorption may be rapid and irregular and if the burn surface is large, toxic levels of the drugs in the body fluids may be reached (absorption from a nondébrided surface has not been measured).

Splinting of an extremity is comfortable and rolled newspapers were incorporated in an outer layer of the pressure dressings. Such splinting decreases lymph flow, which may not be of benefit in a sterile burn wound but is of value in a septic wound. Lymph stasis facilitates the localization of the septic process.

From the administrative point of view in handling casualties of a disaster there are many advantages to simple treatment. The problems of personnel are the most important. In battle or in a civilian disaster there is inevitably a disproportionate number of trained medical personnel to casualties. The simpler the treatment, the fewer the trained personnel required to administer it. The treatment used on the patients from the Cocoanut Grove fire can be applied by nurses or orderlies. Physicians present are freed from the administration of plasma for shock, and oxygen for anoxia. The operating room and a general anesthetic are dispensed with. The operating room facilities are freed for the care of other injuries.

Another advantage of simple treatment from the administrative point of view is the problem of equipment, supplies, and their storage. The substances required for the treatment described are useful in other types of injuries. In contrast, the paraffin treatment with its heater and spray gun complicates the requirements and rules out this method even though it may well give equally good results. Tannic acid and triple dyes have not been recommended for injuries other than burns. Such considerations of equipment are of paramount importance to the Army and Navy where transportation and storage are problems.

PROBLEMS OF INFECTION AND CHEMOTHERAPY

LYONS reports that certain principles of treatment were agreed upon during the period of arrival of the first victims of the Cocoanut Grove disaster. In general it was held that:

1. The prevention and treatment of shock must be the first and immediate consideration.
2. Further contamination of wounds must be avoided.
3. Measures to control the established bacterial contamination would be limited to increasing the resistance of the host by chemotherapy, passive immunization, and maintenance of nutrition.

A strictly aseptic technique was not practical for the initial reception of the patients. All hospital attendants in the receiving ward were masked but it was impossible to mask patients because of the face burns and respiratory difficulties. Clean unsterile gowns were donned by volunteer assistants in street clothes but this was not universal. Hospital attendants wore their usual clothing without other covering. Morphine sedation and intravenous fluid therapy were started as soon as possible after arrival of the victims. The rapid transfer of patients from the receiving ward isolated for their care facilitated supervision of sterile precautions. Attendants here wore clean unsterile operating room clothes, caps, masks, and rubber gloves. The gloves were sterile initially but these were contaminated from wound to wound and from patient to patient. Hospital supervisors and directors as well as military officers were admitted to the ward when masked. As soon as clothing was removed from patients the burns were covered with sterile boric ointment strips and sterile gauze under a pressure dressing. The materials used for this purpose were originally sterile but much cross-contamination occurred in the process of application of the dressings. With the occlusive dressing in place, attention was focused chiefly on the masking of attendants and the "isolation" of the patients. The burn ward was established as a complete hospital unit. One solarium was set up for roentgenological examination and another was converted into an operating room for the change of dressings with complete aseptic technique. Throat cultures were taken of all visitors to the operating room and the room was thoroughly cleansed and set up again before each change of dressing.

Sulfonamide therapy. About two hours after admission the patients were in bed in the isolation ward with bandages in place and intravenous fluids started. A single technician was given a flask of 5 per cent sodium sulfadiazine in sterile distilled water and a sterile 50 cc. syringe; 2 gm. of sodium sulfadiazine in 40 cc. solution were injected into the rubber tubing of each intravenous set. The injection was assured of prompt conveyance to the vein by occluding the rubber tubing momentarily just distal to the injection site. Subsequent chemotherapy was planned for 4 gm. daily, either as 1 gm. every six hours by mouth or 2 gm. twice daily intravenously. Aliquot portions of soda bicarbonate were not given initially but were administered for later hematuria or crystalluria.

Members of the armed forces remaining in the hospital for more than two days received "booster"

doses of tetanus toxoid. Civilians were skin-tested with a 1:10 dilution of horse serum in the morning after admission, when shock was obviously controlled. No positive reactions were observed and 3,000 units of tetanus antitoxin were given to all civilian patients with surface burns, with 3 exceptions. The 3 exceptions were individuals with severe respiratory difficulty in whom it was desirable to avoid any risk of bronchospasm.

Thirteen of the patients received penicillin at some time or other. A dosage plan of 5,000 units every four hours intramuscularly was selected. Accurate appraisal of the efficacy of the penicillin therapy is unfortunately impossible. The dosage employed is now known to have been too small. It was also given in the majority of the patients along with sulfadiazine. No toxic reactions were attributable to the penicillin.

This program of treatment adequately controlled invasive infection. There was no evidence of cellulitis, lymphangitis, lymphadenitis, or bacteremia. Superficial burns healed without suppuration in the usual ten to fourteen days. The deep burns were all frankly infected and suppurative, but there was no evidence of marginal ulceration of healthy tissue. The outstanding feature of the infection was its limitation to the tissue devitalized by the original thermal injury. Pus formation was associated with the separation of the burn eschar and the presence of proteolytic gram-negative bacilli. During this phase of slough local dressings of saline compresses were applied and the process of separation was hastened by bloodless surgical excision of the burn eschar. Fever, leucocytosis, and positive cultures from the wounds were observed as long as the wounds remained unhealed. On the other hand, the decision for skin grafting was based more upon the clinical appraisal of the wound and the nutritional status of the patient than upon the bacteria present in the wound.

In summary, it may be stated that the method of treatment confined the bacterial infection to the devitalized tissue and protected the living cells from invasive infection or marked local necrosis.

The inability to identify accurately the depth of thermal injury in the immediate post-traumatic period of observation is a serious handicap in the final evaluation of any method of treatment. It may be impossible to distinguish between a deep burn and an infected superficial burn by an examination of the wound prior to skin grafting The author's experience indicates that a superficial burn heals kindly with any method of treatment that prevents destructive hemolytic streptococcal infection. It is also true that no method of treatment has arrested the growth of bacteria in the deeply burned tissues. The treatment adopted in this group of cases was based upon the premise that the preservation of the vitality of the undamaged cells was a realistic objective in the treatment of burns. It is believed that reasonable success attended the use of a nonadherent occlusive local dressing and systemic supportive and antibacterial therapy. The failure to sterilize the devitalized burned tissue by such a method was not unexpected.

PROCEDURES IN REHABILITATION OF THE SEVERELY BURNED

CANNON reports that 14 of the 39 patients admitted on the night of the Cocoanut Grove disaster remained in the hospital after the special casualty ward was discontinued. Ten of these patients had third-degree burns of sufficient extent to require further treatment. Only 1 of the 10 was hospitalized for as long as eighteen weeks. The average stay of the others was ten weeks, the minimum was three and one-half weeks, and the maximum fourteen and one-half weeks. During this time, one or more skin-grafting operations were performed on 9 of the 10 patients. The tenth patient had a small area of deep burn on the back which rapidly healed from the margins without grafting.

Treatment of the local wounds consisted of the application, with firm pressure, of primary occlusive dressings of fine-mesh gauze lightly impregnated with boric-acid ointment. Similar dressings were used after the first were changed between the fifth and tenth days. By the tenth to twelfth day the destroyed skin had begun to separate and there was suppuration about the margins with pus escaping through openings in the slough. In order to insure better drainage of the wounds, constant wet dressings, with a single layer of fine-mesh gauze against the granulations, were applied at this time. These were kept moist by instilling 2 per cent boric-acid solution through Dakin's tubes incorporated in the dressing. They were changed every second or third day. An alternation of wet and boric-ointment dressings was tried, but because of the discomfort of the latter, especially on the hands, the wet dressings were continued until the time of grafting. The Bunyan envelope was used for several days in 4 patients who had burns of the hands and forearms. The patients found them uncomfortable. The common complaint was of the humidity of the atmosphere when the bag was filled with oxygen and the burning pain when filled with normal saline solution. The absence of support for the hand and discomfort on contact of the hand with the envelope were also commented upon. Strands of slough and exudate were suspended in the water but did not separate. However, no hypochlorite was used, as Bunyan recommends.

An effort was made to hold the hands in the position of function but this could not be continued because of the pain. Flexing of the fingers put the open wounds on the dorsum under tension, and the patients could not tolerate it. Flexion also caused blanching of the granulations or skin over the metacarpophalangeal and interphalangeal joints, which increased the danger of further necrosis of tissue and possible exposure of the extensor tendons and the joints. Therefore, the fingers were allowed to remain in extension and the wrist in a neutral or

slightly dorsiflexed position. This position was maintained until operation, at which time the hand and fingers were splinted in a more nearly normal functional position.

The use of wet dressings applied with moderate pressure was continued after the slough had separated. The exposure of the raw surface, especially of the hands, was painful, and in some cases nitrous oxide-oxygen anesthesia was given to help the patient's morale by eliminating the pain and to reduce the time taken for the procedure. The wet dressings acted as a keratinizing stimulus, particularly on the areas of second-degree burn adjacent to the granulations and on the advancing marginal epithelial surfaces. This débris did not develop when an ointment dressing was applied. The débris, which became macerated, grew staphylococci and saprophytes on culture. At each change of dressing the surfaces were carefully cleansed with soap and water to reduce as much as possible this source of contamination of the wounds. The persistence of infection and edema of the granulations after the slough had separated may be attributed in part to this maceration. In most of the cases general chemotherapy had been discontinued before the time of grafting. Local sulfanilamide powder, in controlled doses, was dusted on the raw surfaces preoperatively in several cases. The edema subsided and the drainage decreased with this treatment more rapidly than with the wet dressings alone. There were no losses of the graft following the use of sulfanilamide. All patients were given a high protein and high vitamin diet throughout the hospital stay.

Split-thickness grafts were used for covering the raw surfaces. At the operation the raw surfaces were prepared with soap and water. The granulations and the narrow zone of skin that had grown in about the margin were shaved off in all cases, except on the hands of 2 patients. There was a moderate loss of blood in this procedure, but the graft acted as an efficient hemostatic agent, and a smooth, firm base for it was secured. Most of the grafts were sutured accurately in place, but when a carefully applied dressing gave adequate anchorage, sutures were not used. The grafts were perforated only if oozing persisted beneath them.

All postoperative dressings were applied wet and kept wet by irrigation through Dakin's tubes. A single layer of fine-mesh gauze was used against the graft, and the overlying dressing consisted of sponges and a thick layer of mechanic's waste held firmly in place with cotton bandages. Sterile well padded wood splints were used at the knees. The first dressing was applied on the fifth or sixth day after operation. Boric-ointment gauze was applied in all cases. Subsequent dressings were applied on alternate days as long as was necessary. All the grafts were successful except in 2 cases.

It seems reasonable to conclude from these observations, in regard to both the second and third-degree burns, that débridement and cleansing need not be part of the treatment. Tissue resistance and general chemotherapy can be relied upon to prevent invasive infection. However, for success, an ointment gauze should be used to allow serous drainage into the overlying dressing. The surface must not be sealed by an impervious membrane or eschar. Precautions should be taken to reduce contamination by avoiding careless exposure of the wounds at the primary dressing and too frequent subsequent changes. For this reason and because all wounds in these cases remained comparatively free from infection, the first change of dressing should probably be postponed for from twelve to fourteen days. The importance of the general nutritional state to the spontaneous healing of burned surfaces and the preparation of these surfaces for successful skin grafting cannot be overemphasized. Only by early skin grafting can large burned areas be covered and the development of contractures be avoided.

A NOTE ON PHYSICAL THERAPY

WATKINS reports on 6 patients who received severe burns to the dorsum of the hands and wrists in the Cocoanut Grove disaster and were referred to the Physical Therapy Department of the Massachusetts General Hospital. As these patients' hands were splinted in extension, the aim of physical therapy was to restore flexion in the digital joints, and wrists also if involved. During the first few weeks of treatment the grafts and newly epithelized areas were quite thin and sensitive to very minimal trauma whether mechanical or due to heat. Because of this, a layer of lanolin was gently applied over the new epithelium. The whirlpool bath, at a temperature of approximately 104° F., was then used for a period of from fifteen to twenty minutes. While still in the bath the patients were instructed to start gentle, slow, steady active flexion of the fingers and wrists up to the point of discomfort. When sufficient flexion allowed, the patients were given rubber sponges to grasp, as a form of underwater exercise. After several weeks of the whirlpool bath, when the epidermis was stronger and thicker, the melted paraffin wax bath was substituted for it. The temperature in these baths was maintained at 126° F., and, accordingly, they produced much greater and longer-lasting hyperemia and increased relaxation of the tense structures. In addition, a thin film of oil remained after removal of the wax coating, which was an excellent lubricant for massage. Following this, thermotherapy massage of a special type was given. This consisted of gentle circular and longitudinal friction at the junction of the normal and involved areas. The friction was not between the technician's fingers and the skin, but between the skin and subcutaneous layers and the underlying bone, tendons, and muscles. By this method some loosening of the scar could be obtained without traumatizing of the new skin. Massage was also given in such a way as to pull the normal skin in the direction of the knuckles in order to relax tension which was maximal at that point. Simultaneously, with this stretching of the normal skin the patient was in-

structed to actively flex the fingers as much as possible.

Exercises followed massage and for the most part were active guided voluntary motions. Emphasis was placed on slow steady stretching to the point of discomfort and to the degree of skin tension thought advisable as judged by the blanching over the metacarpophalangeal and interphalangeal joints. In addition to intensity, the frequency of repetition of the exercises had to be regulated, both during treatments and at home.

An important part of the therapeutic exercise program was teaching relaxation. These patients unconsciously had a tendency to hold the fingers in complete extension and protected the hands from all possible contacts. The occupational therapists were helpful on this score in suggesting and supervising practice work such as typewriting, knitting, and light carpentry.

No true end-results are warranted at the date of publication of this article as the physical therapy for these patients has really just begun. It is possible to demonstrate, however, the rate of improvement in function as progress has been recorded by double-exposure action photographs. The most striking feature, so far, concerning return of function following physical therapy, was the slowness and difficulty in regaining flexion of the metacarpophalangeal joints in certain cases in spite of good healing and take of the grafts. Analysis of these instances revealed that if the burned area extended beyond the dorsum of the hand and involved the wrist as well, finger flexion was always more limited. It does not appear likely that tendon involvement is responsible since wrist flexion was not limited proportionately. Normally, flexion of the metacarpophalangeal joints results in distal movement of the skin over the wrist and hand as much as from 6 to 8 mm. Restriction of this skin movement, which should start 2 to 3 cm. proximal to the wrist, is the probable mechanism of the prolonged finger disability.

The return of function already obtained in these patients under treatment for a relatively short period of time is encouraging. There appears to have been minimal permanent joint or tendon injury and the prognosis seems good for eventually securing excellent function of the hands.

THE PROBLEM OF BURN SHOCK COMPLICATED BY PULMONARY DAMAGE

COPE and RHINELANDER state that the pulmonary lesions in the casualties of the Cocoanut Grove disaster were unexpected and complicated the care of the shock. The usual plan of action for the care of shock due to burns had to be promptly modified. Carbon-monoxide poisoning with its bright cherry-red color of the burn surfaces and mucous membranes, and the inflammation of the burned lungs and airways were quickly detected, but there was delay in recognizing that the resulting anoxia was the cause of the mania in some of the patients. Beecher, in his article, deals with the problems of anoxia. The treatment of burn shock, usually a straightforward problem of maintaining an adequate plasma volume, had to be modified in an effort to prevent excessive pulmonary edema. Anoxia, not ordinary surgical shock, was the primary concern. It was fortunate that the treatment of the burn surface chosen in advance permitted a maximum of attention by the personnel available to the problem of shock. There were no deaths in the first twelve hours. The 7 deaths that occurred took place within from thirteen to sixty-two hours and were the result of pulmonary complications.

The steps taken in the treatment of shock were as follows:

1. Control of pain. Each patient immediately upon admission was given an injection of morphine. This procedure, routine in the treatment of burns, is based on the concept that prolonged pain in itself leads to shock.

2. Minimum of manipulation. Rolling a patient over abruptly tends to disturb the vascular equilibrium with which he is responding to the diminishing blood volume. However, one shift of the patient was made, from stretcher to bed. All subsequent procedures were carried out in bed.

3. Plasma therapy. All except 10 of the patients were given plasma intravenously. Of those receiving no plasma, 5 had minor pulmonary complications and no surface burns, and were discharged from the hospital in the first few days. The other 5 had minor surface burns and various degrees of pulmonary signs. Plasma therapy was deliberately withheld from the patients with early signs of pulmonary damage and with minor, or no, external burns. The initial dosage of plasma was determined on the basis of the surface area of the burns. For each 10 per cent of the body surface involved, it was planned to give 500 cc. in the first twenty-four hours. Because the plasma delivered by the Blood Bank during the first thirty-six hours was diluted with an equal volume of physiological saline solution, the patient was to receive 1,000 cc. of fluid for each 10 per cent burned. The plasma dosage was modified subsequently on the basis of repeated hematocrit and serum-protein determinations. The results of this intravenous plasma saline therapy were apparently satisfactory in the initial twelve hours. Although forms of shock certainly existed, little or no burn shock was encountered.

All patients showing a severe degree of the typical burn pattern, burns of the head and hands, developed hemoconcentration and eventually required more plasma in the first twenty-four-hour period than had been calculated by the surface area formula. Massive edema formed beneath the deep burns of the face and scalp in spite of the pressure dressings. The edema fluid was dispersed downward to the neck and over the shoulders and chest. Apparently, in the deeper burns there was a correspondingly deeper damage of the subcutaneous capillary bed with an increasing extravasation of plasma into the loose areolar tissues beneath the face and

scalp and downward into the fascial planes of the neck. In the mild burns of the face, such massive edema did not occur and hemoconcentration was not excessive. In spite of the early signs of pulmonary damage, plasma was given to most of the patients. Each patient was carefully watched and it was withheld from those who, on the basis either of the mildness of their surface burns or lack of hemoconcentration, apparently did not require it. With the progression of pulmonary signs, however, more caution was exercised. After 3 patients had died with signs of pulmonary edema the policy of allowing a certain amount of hemoconcentration to persist was resolutely adhered to in all patients with lung damage. The hematocrit readings were maintained around 50 per cent. Normal kidney function was maintained in all but 3 patients in spite of the hemoconcentration allowed in patients with pulmonary complications.

Hemoglobinuria was recorded in 9 patients. In 1 who showed a mild degree it was probably caused by the sulfadiazine, for there were concomitant crystals, and this patient alone of the 9 did not show albuminuria.

4. Chemotherapy. Chemotherapy to effect bacteriostasis is an integral part of the modern treatment of burns. At the moment, the sulfonamide preparations prevail; unfortunately they occasionally lead to untoward results and disturb organ function and the metabolism.

5. Maintenance of nutrition. In the treatment of burn shock every effort should be made to administer the necessary fluid and protein through the gastrointestinal tract. Patients with less than 10 per cent of the body surface burned, particularly if mildly burned and if they are nauseated or vomiting, may be treated by this route. They should drink readily digestible fluids with a high protein content, such as, milk and milk products, and high-protein bouillons with amino acids added. Warning should again be given that if there are deep burns of the face and scalp, particularly if there are acute pulmonary lesions as well, there may be an unexpectedly great loss of plasma volume, and intravenous plasma therapy may be required.

Attention to the necessary accessory food substances is also imperative. All of the patients received large doses of the vitamins, both as natural and synthetic substances, from the first day. In some, these substances had to be given intravenously.

6. Adrenocortical extract. This extract, containing the active principle of the gland, has been recommended in the treatment of burn shock. The predominant signs and symptoms of adrenocortical insufficiency, both in man and animals, are those of shock. Among other findings there are a low blood pressure, hemoconcentration, and an elevation of potassium and phosphate in the blood. Such findings are also characteristic of shock appearing after trauma, burns, intestinal obstruction, and sometimes severe infection.

Adrenocortical extract did not affect the pulmonary edema or the general bodily function of the 2 severely injured patients to whom it was administered.

A NOTE ON THE BLOOD BANK

SOUTTER reports that a blood bank is a requisite for the efficient handling of patients in a disaster. In the first place it is economical. In the second place, with burn casualties particularly, it is imperative to feel free to administer all the plasma necessary. There need be no restraint in the use of frozen plasma. Dried plasma, with its content of mercurial preservative, offers a drawback, since, theoretically, kidney damage may result if too much is given.

The administration of fluids to victims of the Cocoanut Grove disaster began with a saline infusion started through an intravenous apparatus and later through the plasma sets with Baxter filters. As soon as plasma was available, sixty minutes after the arrival of the first victim, these saline flasks were changed to plasma. The system of fluid administration at the Massachusetts General Hospital has in recent years been one of using the most peripheral veins first, usually those on the back of the hands. A sharp No. 19 or No. 20 needle is inserted for the administration of saline and glucose solution, but at least a No. 19 needle is used for transfusions. Cannulae, involving frequent subsequent destruction of the veins, are rarely used. The extremity is carefully splinted and the needle well strapped to it. The needle is inserted with the aid of a glass adaptor rather than with a syringe. On the night of the fire this policy was employed, but because of the number of arm and hand burns, a very high percentage of foot and leg veins were used. These are in an area difficult to splint. They are often at an angle which impedes the insertion of the needle and subsequent fixation. Furthermore, the situation was made worse by the patients' being transported from the emergency ward, by their restlessness, and their being turned for the application of dressings. It was necessary to cut down on the veins of 8 patients during the first night and insert cannulae.

There were no reactions, that is, there were no chills reported, but possible temperature changes were masked by the pyrexia following the burns. There was but 1 patient with jaundice, although others received plasma from the same pool without any untoward effect. It was believed that too much saline solution was given, although the maximum administration to any patient was 2,250 cc. in twenty-four hours. It was possible that much more might have been given and that this amount of sodium chloride was inadvisable. The author began to dilute the plasma with 50 cc. of 50 per cent dextrose in the first pools made immediately following the disaster. With fresh centrifuged blood, these pools were being used within thirty-eight hours after the fire. Fibrin clotting was very limited.

A NOTE ON THE THROMBOPHLEBITIS ENCOUNTERED

MOORE found that virtually all of the factors which predispose to the formation of thrombi in the

veins of the leg are present in a patient recovering from a burn. Shock with decreased blood flow and lowered venous pressure, hemoconcentration with increased blood viscosity, prolonged immobilization, circular dressings, injections into the veins of the leg, sepsis, edema, and nutritional deficiency may all be expected to contribute to some degree. Of the 39 patients cared for in the Massachusetts General Hospital following the Cocoanut Grove disaster, 5 presented thromboembolic phenomena of clinical significance. This represents an incidence of 13 per cent. However, of the 9 patients hospitalized for a prolonged period and requiring grafts to third-degree burns, 4 developed evidence of thrombosis of the leg veins, an incidence of about 45 per cent. Two of these presented roentgenological evidence of a pulmonary infarct.

From time to time it became necessary to perform punctures of the femoral vein, either to get blood for study, or to give intravenous infusions to patients in whom other veins were not available. This was done in 7 patients, and in only 1 did thrombosis develop. However, there was such a long interval between the femoral vein puncture and the development of the thrombosis, that it is probable that there was no connection between the two. One of the patients was of especial interest because she had at least eight punctures of the femoral vein as well as extensive septic burns on both legs. She never developed any evidence of pulmonary infarction. Examination of the calf veins was impossible due to overlying burns.

The presence of burns or sepsis in the legs does not seem to predispose to thrombosis, provided, of course, that the sepsis does not progress to the point of involvement of the larger blood vessels. However, lesions on the legs may be an indirect cause of venous complications if tight circular bandages which obstruct and distend the venous system distal to them are used. Of the 5 patients in this group with thromboses, only 2 had leg burns.

It is believed by the author that patients who have been severely burned are prone, in a rather high percentage of cases, to develop thromboembolic phenomena from the veins of the legs. Constant vigilance must be exercised, particularly in relation to prevention. The position of the patient in bed, and mobilization in bed with measures taken to insure adequate venous circulation are important factors in preventing thrombosis and embolism. When leg signs are positive, or evidence of pulmonary infarction is present, the treatment of choice is immediate ligation of the involved veins.

METABOLIC OBSERVATIONS

COPE, NATHANSON, ROURKE, and WILSON report on metabolic studies which were carried out on 29 of the 39 victims of the Cocoanut Grove disaster treated at the Massachusetts General Hospital.

A complete nitrogen balance was obtained in 9 patients, and a potassium balance in 6 of these. The excretion of 17-ketosteroids in the urine was measured in 23 patients. In 1 the calcium and phosphorus excretion was determined. The term "17-ketosteroid" is applied to those organic compounds which have a ketonic radical attached to the 17-carbon atom of a phenanthrenecyclopentane nucleus. Although this nucleus is common to such sterols as cholesterol, the sex hormones, the adrenal cortical hormones so far identified, and members of the vitamin D group, the 17-ketosteroids which are excreted in the urine appear to represent, for the most part, metabolic end-products of the androgenic hormones. These end-products originate both in the testis and the adrenal cortex of both sexes. They do not represent, apparently, the entire biologically active secretion of the adrenal cortex.

In many patients there was a moderate negative nitrogen balance in the first week. For the same periods, in these patients there was a caloric intake inadequate for maintenance. Nitrogen equilibrium was easily established when the caloric and nitrogen intakes were increased. The level of nitrogen excretion was fairly constant from day to day and was not altered by a rising protein intake; it was, however, less in the later weeks than during the first week.

The level of nitrogen excretion bore no relation to the severity of the burn, but males excreted more than females. It is believed that the moderate nitrogen loss encountered was due to the relative absence of invasive infection.

Potassium equilibrium was maintained. The source, therefore, of the nitrogen lost during the period of negative nitrogen balance was noncellular protein.

The 17-ketosteroid excretion was elevated during a period corresponding to the negative nitrogen balance. After the first week it fell off abruptly to a low level. During this period the nitrogen excretion, however, did not change. The eventual return of the 17-ketosteroid excretion to normal was simultaneous with the return to good health. The relation of the 17-ketosteroid excretion to nitrogen metabolism and to adrenocortical activity was not settled.

An abnormal growth of hair was encountered in the 6 women hospitalized for more than three weeks, despite the low 17-ketosteroid-excretion levels.

The ease with which nitrogen equilibrium was obtained, and the abnormal hair growth in the women do not suggest testosterone administration as routine therapy for patients following burns. It is still theoretically possible that in patients depleted by prolonged sepsis and malnutrition, and with specific testicular and adrenocortical insufficiencies, testosterone therapy might be indicated. In like manner adrenocortical therapy might prove useful.

JOSEPH K. NARAT, M.D.

Pendleton, R. C.: The Paraffin-Wax Open-Air Treatment of Burns. *J. Am. M. Ass.*, 1943, 122: 414.

The paraffin-wax spray method is proposed by the author as the ideal method for the local treatment

of war burns. It is believed to be ideal because the ingredients are easily available, can be used by untrained personnel, and can be applied to any part of the body. It permits of easy inspection, requires no gauze dressings, and relieves pain.

The formula for the preparation of the spray consists of 670 gm. of paraffin wax, 250 gm. of petrolatum, 150 cc. of heavy liquid petrolatum, 50 cc. of cod-liver oil, 50 gm. of sulfanilamide, and 1 gm. each of menthol, camphor, and eucalyptus. The melting point (117°F.) may be varied by changing the concentrations of the petrolatum or of the wax.

The preparation is applied to the burn without cleansing or débridement of the wound. The cracks in the paraffin coating of the burn provide the necessary drainage for surface exudates. The paraffin dressing is easily removable and the burn area may be irrigated with a nonirritating solution, after which it is sprayed again. Patients treated by this method are encouraged to use the affected limb freely. As a result, contractures and functional disabilities are markedly reduced.

BENJAMIN G. P. SHAFIROFF, M.D.

Clark, A. M., Colebrook, L., Gibson, T., and Thomson, M. L.: Penicillin and Propamidine in Burns. Elimination of Hemolytic Streptococci and Staphylococci. *Lancet*, Lond., 1943, 244: 605.

Hemolytic streptococci and other pyogenic cocci play a dominant role in the delay of healing of body burns. These organisms find their way to the burn or open wound quickly from various sources, and once established there they serve as a potential menace to other patients in the ward whose wounds are not infected. Daily powdering with sulfanilamide was tried in 1941 and the hemolytic streptococcus frequently was eliminated after four or more days. Further experience, however, showed that sulfanilamide was not the ideal agent for this purpose. Sulfanilamide-resistant strains are not infrequent; the daily reapplication of the drug in burns is undesirable because of the discomfort to the patient and disturbance to the progress of wound healing; and, also, the daily administration of the sulfonamides on extensive burns is not without risk of excessive absorption. The substitution of a 5 per cent sulfanilamide cream for daily powdering with sulfanilamide gave less satisfactory results. These considerations led the authors to study penicillin and propamidine as alternative agents for eliminating staphylococci and hemolytic streptococci from burns.

Penicillin was tried on a few cases by dusting the powdered sodium salt on the burn surface, but this proved painful to the patients. The best menstruum was found to be a cream made of lanette wax Sx (50 gm.), castor oil (120 cc.) and water (275 cc.), to which enough penicillin was added to yield 120 units per gram of cream. The cream is active for fifteen days when kept at room temperature, and for four weeks at least if kept in the refrigerator at 2° C. On burns the cream is applied thickly over the involved area, which is then covered with gauze and wool. The application is repeated at intervals of forty-eight hours. Samples of the cream taken from wounds show some activity at the end of twenty-four hours, but none at the end of forty-eight hours. The calcium salt has been found to be as satisfactory as the sodium salt. No local or general toxic effects were observed from its use, and separation of slough occurred at about the usual time (from fifteen to twenty-five days).

The results are tabulated in the original article. Hemolytic streptococci disappeared from 41 of the 54 wounds (76 per cent) within three and one-half days from the first application of penicillin, and did not reappear after it was discontinued. In the remaining 13 cases the results were less striking, but of all the 54 wounds there was not one in which the penicillin appeared to be without any effect upon the streptococcal flora. In 7 instances the strains which promptly disappeared from the wounds were insensitive to sulfonamide. Staphylococci also disappeared from many of the wounds. On the other hand, coliform, proteus, and pyocyaneus bacilli, when present, usually persisted in the wounds.

Propamidine was employed in 0.1 per cent concentration in a Mumford base (lanette wax, hard paraffin, and technical white oil). Most cases had 4 applications at intervals of forty-eight hours and a few cases, five applications. No toxic effects were observed, either locally or generally, nor did the applications cause pain. Healing was satisfactory in most of the cases, including several of those in which the streptococci were not eliminated. The hemolytic streptococci disappeared rapidly from 21 of 34 wounds (62 per cent). The 13 wounds in which the organisms were not eliminated had hemolytic streptococci which were sensitive in vitro to propamidine.

A stronger (0.2 per cent) cream is under study. Other in vitro studies showed that 4 sulfonamide sensitive strains of streptococci were sensitive to propamidine. In the concentrations used propamidine appeared to have less influence on the staphylococci than did penicillin, although in some cases these bacteria disappeared promptly. The gram-negative bacteria were not affected by propamidine.

EDWIN J. PULASKI, M.D.

MacLennan, J. D.: Streptococcal Infection of Muscle. *Lancet*, Lond., 1943, 244: 582.

True gas gangrene arises when muscle becomes infected with pathogenic anaerobes and should be differentiated from anaerobic cellulitis which is an infection with spore-bearing, gas-forming anaerobes, not of muscle but of connective tissue.

In this investigation on anaerobic infections of war wounds in the Middle East it was observed in a limited number of cases that streptococci also are capable, in association with other organisms, of infecting muscle and of producing a condition liable to be confused with gas gangrene. The local and general symptoms were massive infection of muscle, together with discoloration, edema, serous exudate, gas formation, local pain, and generalized toxemia.

In the 8 reported cases small Gram-positive, strictly anaerobic and anhemolytic cocci (streptococcus pyogenes) were isolated, but no clostridia were found.

In spite of the superficial similarity to gas gangrene the differential diagnosis of this condition is fairly simple and is based on several points. The cutaneous erythema is much more pronounced and extensive than in true gas gangrene in which the discoloration of the skin is always less extensive than that of the underlying muscle. The discolored muscle in the streptococcal infection is still alive and will react to stimuli without having the boiled and coagulated appearance of muscle in gas gangrene. The smell is neither so pungent nor so sweet as in anaerobic infections. A muscle smear stained by Gram's method will reveal a vast number of streptococci while Gram-positive bacilli are usually present. The presence of either clostridia or of spore bearers will make the diagnosis very difficult since it is known that streptococci are quite often found in cases of gas gangrene.

The treatment consisted of large doses of sulfonamides with the minimum of surgical intervention.

CONRAD L. PIRANI, M.D.

McIntosh, J., and Selbie, F. R.: Chemotherapeutic Drugs in Anaerobic Infections of Wounds. *Lancet*, Lond., 1943, 244: 793.

The discrepancy between the promising results obtained from animal experiments with clostridial infections by the use of various drugs and the recent results in casualties among civilians and soldiers with gas gangrene, which failed to show any appreciable reduction in incidence in spite of both prophylactic and therapeutic chemotherapy, led the authors to retest the sulfonamides, the acridines, propamidine, and penicillin as to their value in these conditions.

In the present tests a severe, standard infection in mice was devised. Mice were employed because they are relatively susceptible to anaerobic infections. The method adopted consisted of producing the disease by the intramuscular injection into the right thigh of 100 minimum lethal doses of washed organisms suspended in a solution of 2.5 per cent calcium chloride and followed an hour later by an injection at the same site of the chemotherapeutic drug under test. The interval of one hour was chosen because by that time infection has developed, as shown by the presence of considerable edema and confirmed by histological examination, which showed also that the bacteria have invaded muscle. Organisms generally do not invade the blood stream until three hours after their injection.

Preliminary tests were made on the bacteriostatic action of the agents tested by means of pretested 1/5 strength dextrose meat broth containing the drugs, into which 0/5 cc. of an eighteen-hour culture was inoculated. The tubes were incubated anaerobically for a period of from twenty-four to forty-eight hours, and the tube in which bacteriostatic action was complete was noted. All the agents have bacteriostatic action in high dilutions against clostridia welchii, septicum, and edematiens.

Toxicity tests on mice were made, and the local and general effects of intramuscular injections were noted. The maximum tolerated doses of proflavine and propamidine were each 1.5 mgm., of the sulfonamides 120 mgm., and of penicillin, much greater. From the therapeutic doses, little or no local effect was noted.

From the doses used, the results showed that the most effective chemotherapeutic substances against the individual infections were penicillin (34 units) against clostridia welchii and edematiens, and sulfathiazole (40 mgm.) against the clostridium septicum. The acridines (0/5 mgm.) were moderately effective against all three anaerobes, but in a much lower degree. Propamidine (0/5 mgm.) had a lower activity still against all three organisms, although its action in the case of the clostridia welchii and edematiens was about the same as that of the sulfonamides. Some slightly better results against the three organisms were obtained when mixtures of proflavine (0.4 mgm.) and sulfathiazole (40 mgm.) were used. The authors recommend this mixture because of the improved results and because of the variation in individual susceptibility of the various organisms to any one drug. They caution, however, that because of the rapidity with which gas gangrene spreads, the value of local treatment becomes restricted, and general treatment, including antitoxin administration, is then essential.

EDWIN J. PULASKI, M.D.

ANESTHESIA

Mietus, A. C., and Mitchell, R. M.: Caudal Anesthesia in Obstetrics. *Am. J. Surg.*, 1943, 60: 399.

Eight hundred cases given caudal anesthesia in the obstetrical service of the Milwaukee County Hospital are reported. Originally used for outlet forceps and episiotomies, this type of anesthesia is now used for all obstetrical procedures except internal versions, including cesarean sections. For the most part, the block is administered to women in the second stage of labor for the delivery of the newborn. From the clinical data reported, it appears that caudal block most nearly approaches the answer to the problem of alleviating the sufferings of the woman in labor.

The lateral decubitus or the knee-elbow position may be used for the injection. A 2 per cent aqueous solution of metycaine is used as the anesthetic solution. No adrenalin is added. From 10 to 70 cc. of the solution is administered, according to the degree of anesthesia that is necessary. Larger doses permit the performance of cesarean sections. When small doses of the solution are injected, sensory and motor function of the lower limbs is retained. No influence on the fetus has been noted and the third stage of labor is unimpaired. Blood loss is minimal.

Untoward effects, such as transitory drops in the blood pressure, were noted when large single injec-

tions were given. Vertigo, agitation, disorientation, auditory and visual hallucinations, apprehension, or actual generalized colonic convulsions of short duration occurred in approximately 3 per cent of the series. When the patients were sedated adequately with barbiturates, there were no untoward reactions.

Seven hundred and three of the patients were primiparas. The greatest number were delivered with low forceps and by episiotomies. There were some mid-forceps deliveries, and only 1 high-forceps delivery. Twelve women were delivered by cesarean section, in 1 of whom a Porro section was performed, all entirely under caudal anesthesia. In 381 of the patients, 25 cc. of a 2 per cent solution of metycaine were injected; in 368, from 35 to 40 cc. were given, and in the remaining 51 cases the quantities varied from 10 cc. to 70 cc. In the ordinary obstetrical procedure, 35 cc. is adequate. The average latent period between the time of administration of the anesthetic and the time when its effect first became evident about the anal region, was six and nine-tenths minutes. The average duration of anesthesia was one hour and twelve minutes. Ideal results were obtained in 714 cases. In 50 cases anesthesia of the perineum developed but the patient remained aware of contraction pains, or complained of pain when traction was applied with the forceps. In 36 cases the block failed completely, this being attributed to technical errors.

Caudal anesthesia offers relief from pain, and relief from the excitability that is attendant particularly with the excitomotor reflex of the second stage of labor. It permits uterine contraction to continue unaffected. There is no interference with the normal mechanisms of labor, nor does it prolong the first stage. It facilitates operative vaginal deliveries in the second stage. It permits complete co-operation of the patient and presents no peril to her infant. The third stage of labor is unaltered.

MARY KARP, M.D.

Irving, F. R., Lippincott, C. A., and Meyer, F. C.: Continuous Caudal Anesthesia in Obstetrics. *N. York State J. M.*, 1943, 43: 1023.

The authors report their experiences with 218 cases of labor and delivery conducted under continuous caudal analgesia, and describe a technique in which a catheter instead of a malleable needle is used. Since the catheter is flexible, it facilitates management of the case.

There have been no major complications in this series. The method is contraindicated in pilonidal cyst, infection near the site of injection, hypotension, sensitivity to the drug, and also in placenta previa, ablatio placentae, and disproportion. The method is time-consuming and requires a frequent check of the blood pressure, fetal heart, and height of anesthesia.

There has been no apparent increase in maternal morbidity. The second stage of labor is definitely prolonged and a significant increase in operative deliveries has been observed. In the first 100 cases there were 10 failures, 7 due to technical errors and 3 due to the procedure itself. In 2 cases caudal anesthesia was induced too late in labor, and in 1 case there was no apparent explanation for failure. In the last 118 cases a sustained fall in the blood pressure occurred in 22, or 18.6 per cent, of the cases.

Fetal distress was observed in 29 cases, or in 13.3 per cent of the entire series. This was found to be associated with a sustained low blood pressure or some obstetrical difficulty. One stillbirth, probably the result of caudal anesthesia, is reported. Three neonatal deaths were encountered, all in small babies.

Four possible causes of fetal distress are noted:

1. The knee-elbow position which may have caused pressure on the cord.
2. The drug employed may have passed the placenta and had some direct effect on the fetus.
3. Dilatation of the cervix may have taken place so rapidly that uterine tone and contractions may have been greatly increased.
4. Fetal anoxemia may have resulted from ischemia of the uterus.

In analyzing these factors, the authors were unable to find significant differences when other positions were used. Pontocaine in a 0.25 per cent solution has given the most satisfactory results. At the present time there is no evidence that increased tonicity of the uterus or prolonged contractions play any part in the production of fetal distress. Anoxemia of the fetus is probably significant. This statement is supported by the observation that improvement in the fetus results following the administration of oxygen to the mother, and by the fact that ischemia of the uterus has been seen at cesarean section. A correlation between sustained low blood pressure and fetal distress is indicated by the fact that the blood pressure and fetal heart rate recover together when the anesthesia is allowed to wear off, and the greater the fall in blood pressure the more frequent is fetal distress.

Patients with a sustained fall in blood pressure showed several uniform characteristics:

1. The drop in pressure was progressive.
2. A relatively high diastolic pressure was maintained; the pulse pressure suffered most.
3. The pulse rate rarely rose above 110.
4. The patients were pale and showed varying degrees of apprehension or apathy, but never displayed "cold sweats."
5. In some cases the level of anesthesia was high, and in other cases it never rose above the umbilicus; in several cases the anesthesia was high without a serious fall in the blood pressure.

The authors believe that the method offers much in the way of painless childbirth, but has certain dangers. Until more experience with it is gained its use should be restricted. JOHN A. GIUS, M.D.

Siever, J. M., and Mousel, L. H.: Continuous Caudal Anesthesia in 300 Unselected Obstetrical Cases. *J. Am. M. Ass.*, 1943, 122: 424.

The authors describe their method of producing continuous caudal anesthesia in obstetrics. Instead

of the indwelling needle, they substitute a No. 5 French nylon ureteral catheter, which causes less trauma and is less liable to break off. They draw the following conclusions after its use in 300 cases:

1. Continuous caudal anesthesia is satisfactory in most cases.
2. The use of a ureteral catheter is safer and more comfortable for the patient.
3. Epinephrine should be added to the initial injection of anesthetic solution into the caudal canal in all cases except those with toxic reactions.
4. Continuous caudal anesthesia may be of service in cases of eclampsia, for 3 patients with eclampsia were delivered while under caudal anesthesia without any maternal or fetal death and with apparent control of the symptoms of toxemia.
5. Absolute asepsis must be observed at all times.
6. The fetal mortality rate was lower than that noted before this method was used.

JOHN J. MALONEY, M.D.

Batten, D. H.: Cesarean Section under Spinal Anesthesia. *Current Res. Anesth.*, 1943, 22: 143.

This article deals with data obtained from 25 cases of cesarean section accomplished under spinal anesthesia. It is a continuation of a report of a series of 96 sections recently made by the author.

Preoperative medication of morphine and scopolamine in a 25 to 1 ratio was administered ninety minutes prior to the beginning of surgery. The dosage was adjusted in each case to the mother's requirement and was not given to those patients who had not yet fully recovered from a previous dose of morphine or some other analgesic, nor to those in whom some metabolic disturbance rendered the use of these drugs injudicious. Spinal anesthesia was effected with pontocaine-procaine mixtures, the desired level of anesthesia being the fifth dorsal segment. With the exception of headaches of moderate intensity in some patients, there were no untoward postoperative sequelae.

Blood was withdrawn from the umbilical vein of the baby without contact with the air, according to the method of Adriani, and the carbon-dioxide content and the oxygen content and capacity were determined by means of the Van Slyke and Neill technique.

It was found that the inhalation of oxygen in high concentration by the mother during the spinal anesthesia coincided with an increase in the oxygen that was being brought to the baby via the umbilical vein. For this reason, oxygen administered by the B. L. B. mask or with the anesthetic machine was given to the patient as soon as spinal anesthesia was attained. Comparative statistical tables were shown indicating the percentage saturation of oxygen of the blood of the umbilical vein and the carbon-dioxide content when patients received no oxygen during spinal anesthesia, and when they received oxygen, and in those patients who had local infiltration anesthesia with and without oxygen.

Other clinicians have shown that the normal arterial oxygen saturation of the newborn is approximately 50 per cent and that of the mother from 90 to 95 per cent. With nitrous oxide the blood in the umbilical veins of babies delivered by section was 22.3 per cent saturated with oxygen; with cyclopropane, 35 per cent; and with local, 63 per cent.

When oxygen is administered during spinal anesthesia for cesarean section, this anesthetic method has proved valuable in the hands of the authors.

MARY KARP, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Walton, H. J., and Davidson, C. N.: Cholecystography. A Correlation of the Roentgenological, Surgical, and Medical Findings in 355 Cases. *South. M. J.*, 1943, 36: 411.

Following a brief summary of the development of cholecystography, the authors review numerous statistical reports from various sources relative to the findings which may be demonstrated by this means. and comment on their reliability.

In an effort to evaluate cholecystography, as carried out at the University Hospital, Baltimore, Maryland, a survey was made of the cholecystographic examinations of 355 patients. Of these, 100 were subjected to surgery, and the roentgenological, surgical, and pathological findings were correlated. The remaining 255 patients were treated medically. A similar correlation with biliary disease, found clinically, and gall-bladder function, noted roentgenologically, was shown. The oral method of cholecystography was used in practically all cases with the exception of those in which disorders of the gastrointestinal tract, such as vomiting and diarrhea, were present. In doubtful cases, the intravenous method was used to check the oral findings.

In the surgical group, 56 patients had nonfunctioning gall bladders, 22 had poorly functioning gall bladders, and 22 had normally functioning gall bladders. Of the 56 patients in whom there was no visualization of the gall bladder, 53 had definite gall-bladder disease both surgically and pathologically. At operation, 2 patients whose pathological reports showed normal gall bladders were found to have chronic gall-bladder disease, and 1 was found to have a normal gall bladder. An obstructive duodenal ulcer was found in the latter case. Twenty of the 22 patients with poorly functioning gall bladders were found to have gall-bladder disease both surgically and pathologically. The remaining 2 had gall-bladder disease surgically, but were reported as having normal gall bladders pathologically.

The 22 patients with normally functioning gall bladders were operated upon for some condition other than biliary disease, except a few in whom gall-bladder disease was thought to be present. At operation, 18 of these were found to have normal gall bladders, 1 had a chronic cholecystitis (surgically and pathologically), and 3 had evidence of pericholecystitis.

In summarizing their findings, the authors state that roentgenological findings (suggesting both normal and pathological gall bladders), in 91 per cent of the patients subjected to surgery were confirmed at operation. In the medically treated group, discussed in detail, the roentgenological findings were in agreement with the final clinical opinion in 88.7 per cent of the cases. In the presence of liver disease, such as cirrhosis and hepatitis, there were no normally functioning gall bladders. The authors found normally functioning gall bladders in 7 of 9 cases diagnosed as catarrhal jaundice.

A. HARTUNG, M.D.

Einsel, I. H., and Einsel, T. H.: Gall-Bladder Visualization with B (3,5 Di-Iodo-4-Hydroxyphenyl), a Phenyl Proprionic Acid (Priodax). *Am. J. Digest. Dis.*, 1943, 10: 206.

The authors report on gall-bladder visualization with the oral use of B (3,5 di-iodo-4-hydroxyphenyl), a phenyl proprionic acid. Inasmuch as it provides as good, or better, visualization of the gall bladder, and eliminates gastrointestinal irritation, this compound is an improvement over the sodium salt of tetraiodophenolphthalein. (Modell states that he is able to produce gastrointestinal irritation in cats with large doses of the drug compound.)

Preparation of the patient for the examination is similar to that of the Graham-Cole method. On the evening preceding examination, the patient is given a meal consisting of fruit, vegetables, tea, and toast; fats are avoided. One hour later the patient is given 3 gm. of priodax which has been thoroughly stirred in a cup of tea. Fluids are then permitted in moderation, but no food. The patient reports at nine o'clock the next morning and a film is taken. A fat meal consisting of equal parts of milk, cream, and the yolk of an egg is given and a second film is taken two hours later.

Fifty gall-bladder examinations (in 19 males and 31 females) were done by this method. A normal gall bladder was seen in 2 cases in which this had not been seen with the use of sodium tetraiodophenolphthalein. Forty-two examinations showed normal gall bladders, 6 revealed calculi with prolonged emptying, and 2 failed to show a gall-bladder shadow. In 1 of the last 2 cases failure of visualization of the gall bladder was due to a plugged cystic duct, confirmed at surgery. MAURICE D. SACHS, M.D.

Smith, R. M.: Roentgenological Localization of the Placenta without Contrast Media. *Am. J. Roentg.*, 1943, 49: 750.

A knowledge of placental location is often of value to the obstetrician, and procurement of this information without disturbance of the mother or fetus, or without the use of contrast media is desirable. The author reviews the various means which have been used to accomplish such localization with contrast media and calls attention to the disadvantages associated with most of them, which account for their disuse or undesirability. Mention is also made of other investigations resulting in visualization on plain films.

The possibility of demonstrating the placenta roentgenographically first suggested itself to the

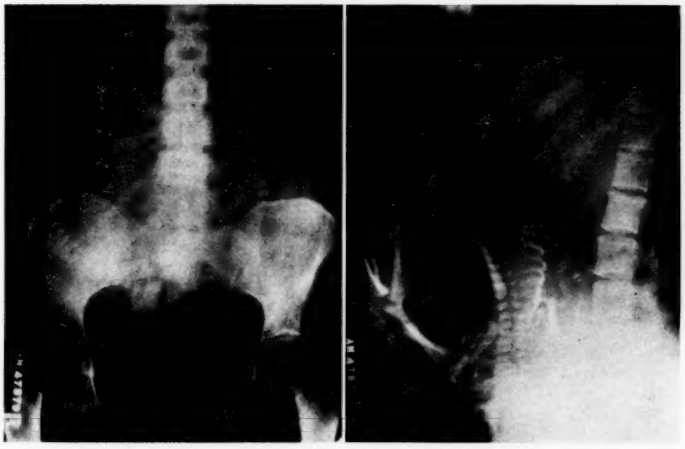


Fig. 1. Left occipitoposterior position of the fetus. Note that the placental shadow is anterior in the lateral view.

author in the course of some work with amniography, when he noted localized densities on plain films corresponding to the placenta as revealed on the amniograms. He found that roentgenograms of the pregnant uterus with soft-tissue technique for the specific purpose of bringing out these details made it possible to visualize the placenta in practically every instance in which it was located in the body or fundus of the uterus.

The diagnosis from the roentgenogram is dependent upon the recognition of the placental shadow, either in the anteroposterior or lateral roentgenogram, or in some instances in both. This shadow is usually on the ventral side of the fetus and is in continuity with the wall of the uterus. It is not changed by shifting the patient from one side to the other or by the assumption of the erect posture, and is definitely not cast by the amniotic fluid. In placenta previa the extent of shadow which is found in the body of the uterus depends upon the type and degree of placenta previa. In lateral placenta previa the shadow is located in the lower portion of the uterine body and disappears behind the shadow of the pelvic girdle. In complete placenta previa the placental shadow is absent from the upper uterine segment. While it is not usually visible in the lower segment either, because of concealment by the pelvic bones, yet the high displacement of the presenting part speaks for its presence there. The diagnosis of complete placenta previa by this method, therefore, is dependent upon the absence of placental shadow from the upper segment of the uterus and displacement of the presenting part from its normal position.

In his summary, the author states that diagnosis of the placental position has been made by roentgen examination without the use of contrast medium in more than 1,000 cases; that the findings in the instance of placenta previa have been confirmed by the obstetrician, both in vaginal delivery and cesarean section; that the method has received acceptance in the obstetrical clinic and apparently has come to play an important part in the management of certain obstetrical difficulties in which such knowledge is of importance. A. HAFTUNG, M.D.

Wilhelm, S. F.: Laminography in the Visualization of the Suprarenal Glands. *J. Urol.*, Balt., 1943, 49: 785.

Normal suprarenal glands are rarely delineated on simple roentgenograms, but tumors of these glands have occasionally been correctly ascribed to massive shadows at the upper pole of the kidney. It is now established that with the aid of the contrast method provided by perirenal insufflation, not only enlarged, but at times normal, suprarenal glands may be clearly outlined.

As a further aid to the visualization of the suprarenal gland, laminography, which permits the delineation of structures at different levels, has been tried, and found practical and useful. The application of this procedure in association with perirenal insufflation has proved of particular value in the delineation of the normal suprarenal gland and in the determination of the lesser enlargements.

Nine patients who were suspected of suffering from disease of the suprarenal gland were studied and the findings of laminography with perirenal air injection form the basis of this article. The normal shadows of the suprarenal gland were most clearly outlined at a surface lying from 6 to 10 cm. above the tabletop. In the cases of enlargement of the suprarenal gland, the most striking views varied at different levels, according to the size and location of the mass. Although the depth at which the kidney lies varies with the thickness of the posterior abdominal wall, it is usually unnecessary to attempt to delin-

Fig. 1. Laminogram showing left suprarenal gland following perirenal insufflation and excretory urography.

eate the structures at a plane less than 5 cm. or more then 12 cm. above the table top.

Brief comments on observations made and illustrative roentgenograms are included.

A. HARTUNG, M.D.

Gonzales-Iman, F.: Retrograde Seminal Vesiculography. *J. Urol.*, Balt., 1943, 49: 618.

The diagnosis of seminal vesiculitis is based upon the history, physical examination (particularly rectal palpation), and seminal vesiculography. Although venereal infection may be present, seminal vesiculitis is almost as common in patients who have never had venereal diseases. Pain is the most common symptom. Careful rectal palpation should be included in the examination of every case, and the method of palpation is described.

For seminal vesiculography the author uses the following instruments: the Peterson urethroscope holder, the Lowsley-Peterson urethroscope, an aspirator, an applicator and phenolglycerine in a 50 per cent mixture. Preliminary preparation consists of dilatation of the urethra with sounds, prostatic massage, and application of phenolglycerine to the posterior urethra through the urethroscope. Urethroscopy is greatly facilitated by the use of the Peterson holder. After from two to six urethroscopic treatments, the urethra is usually fairly clean and ready for vesiculography. Retrograde vesiculography, when carried out in the manner described, is successful in 90 of 100 cases. The most satisfactory contrast medium is diodrast, of which from 1 to 3 cc. are injected. The technique of catheterization of the ejaculatory ducts is very important and is described.

In the Department of Urology of the New York Hospital, seminal vesiculitis is divided into three groups: (1) catarrhal, (2) interstitial, and (3) mixed types. The first and second groups are divided into early, intermediate, and late stages. A résumé of Peterson's description of a normal vesicle and pathological types of vesicles is given. The normal vesicle is ovoid or piriform in outline with the greatest width in its medial portion. Convolutions are of uniform breadth and density. The ampulla is distinctly separate and the vas pursues a lateral course above the terminal pole. In early cases of the catarrhal type there is distention of the gland, involving all or part of it and reducing the vesicoampullar space. A certain number of convolutions may remain preserved. In the intermediate form, there is dilatation of the distal half with the terminal portion raised to or above the level of the vas. In the late stage there is dilatation of the entire gland with straightening of the convolutions which causes the gland to resemble a tortuous hydroureter or a row of circular or oval cavities. In the interstitial type, a few circular or spiral convolutions, with localized tenderness and beginning obliteration of the lumina, are seen in the early stage. In the intermediate stage there are narrow tubular shadows with shallow wavy convolutions. In the late stage, a few irregular cavities may appear to be completely detached. In the mixed type, partial dilatation of a typical interstitial gland, with stricture of the angulation of the ejaculatory or seminal duct resulting in distention, is usually seen.

HAROLD C. OCHSNER, M.D.

Sante, L. R.: Further Experience with Pneumoperitoneum As an Aid in Pelvic Irradiation. *Radiology*, 1943, 40: 447.

There is ample evidence of the extreme radiosensitivity of the intestinal mucosa, which is manifested by colicky abdominal pains, diarrhea, rectal tenesmus, and passage of blood and mucus in the stools. These reactions are less frequently encountered with the present divided-dose technique. It is usually desirable to introduce larger quantities of radiation into the pelvis if vital normal tissues can be safeguarded. By artificial pneumoperitoneum the intestines can be removed from the field of irradiation, and greater quantities of radiation can be introduced with impunity.

After evacuation of the intestinal tract pneumoperitoneum is produced, inflation being carried to a point somewhat greater than that ordinarily used for diagnostic pneumoperitoneum. The patient should be kept in bed the first day, but in most cases may be up and about after the second or third day. Air is used, and ordinarily only one refill, about the seventh day, should be necessary. Roentgen examination is made with the patient lying on the abdomen, head downward, on a tilt table lowered to an angle be-

tween 45 and 50 degrees. In this position the air rises to fill the pelvis, enveloping the pelvic organs and displacing the intestines. The roentgen-ray beam is projected along the pelvic axis, represented roughly by a line between the anus and umbilicus. Necessary measurements are made.

The portals for roentgen therapy are four anteriorly, two on each side, and four posteriorly, two on each side. Two additional lateral portals will add to the parametrial dosage. The lower anterior and posterior fields are centered directly over the parametrium and the beam should be directed perpendicularly to the body. Detailed instructions for the upper anterior and posterior portals are given; these are directed downward into the pelvis, and in the case of the anterior portal a considerable amount of pressure is used. Treatment is continued to a total dosage of 2,000 roentgens for a 15 by 15 cm. portal and 2,400 roentgens for a 10 by 10 cm. portal. The use of the intravaginal cone is discussed.

However, too few patients have been treated by this method to permit an estimate of its value.

HAROLD C. OCHSNER, M.D.

Smithers, D. W., Clarkson, J. R., and Strong, J. A.: The Roentgen Treatment of Cancer of the Esophagus. *Am. J. Roentg.*, 1943, 49: 606.

This article is presented in 3 parts. Smithers contributes an introductory portion in which he discusses the subject in a comprehensive manner from a general standpoint. He states that more successful results ought to be obtainable from irradiation treatment in esophageal carcinoma than have been obtained in the past and that improvement is only to be expected if factors that have contributed to lack of success are eliminated or minimized. Failures are due largely to delay of treatment until the lesion is so far advanced that no therapy can offer much hope of favorable action. Tables collected from various sources are presented; they show the average duration of symptoms before admission to hospital, the relationship between the size of the primary growth and the duration of the symptoms before death, the proportion of cases with different grades of malignancy, and the incidence of distant metastases according to the grade of tumor and duration of the symptoms.

Particular difficulties associated with various methods of treatment are given consideration. Surgery, teleradium therapy, use of interstitial radium or radon, radium bougies, and roentgen irradiation are discussed. In regard to roentgen treatment, it is stated that it is the most effective method of securing palliation and at the same time causing the patient the least discomfort. The advantages it has over other methods are mentioned.

Smithers also presents a detailed description of the method of roentgen treatment adopted at the Royal Cancer Hospital and an account of the results obtained. General considerations regarding cases suitable for radiation therapy and their classifications are included, and the preparation of the patient, care during treatment, and need for careful supervision with frequent blood examinations and other check-ups are stressed.

As regards selection of the treatment fields, their size, shape, number, and position should be such that the best possible distribution of the radiation is obtained throughout the volume irradiated. Those used and the reasons for choosing them are discussed in detail. Diagrammatic figures showing the volume distribution are included. Methods for exact localization of the lesion, and fixation and beam direction are discussed.

The majority of the cases treated in the series studied were given 100 roentgens daily to each of 6 portals, with a 400 kv. peak at 80 cm. distance and a half-value layer of 3.7 mm. of copper. A total between 6,000 and 7,000 roentgens was given in about six weeks.

This report gives detailed information about 54 patients who were given roentgen therapy, 40 of them receiving a complete series. Twelve other cases referred to the roentgen department and 49 obtained from the hospital records are given brief consideration. The results obtained in the 54 cases treated are discussed at some length and tabulated. Strikingly favorable responses were noted in many of the cases and most of the cases showed improvement. Six cases of patients who were still living at the time of this report are tabulated in detail.

Clarkson and Strong present an account of the physical measurement of the distribution of the volume of roentgen-ray dosage due to elongated fields. The method of investigation adopted was to make dosage measurements throughout the whole volume irradiated by such a field and to construct dose contour diagrams in planes normal to the surface, the results for each of the six fields being combined afterward in the appropriate positions to obtain a diagram of the complete dose distribution at certain planes in the body.

Details of the investigation and findings obtained are discussed.

H. HARTUNG, M.D.

Reidenberg, L.: Low-Dosage Irradiation to the Pituitary Gland and Ovaries in Amenorrhea and Dysfunctional Uterine Bleeding. *Am. J. Obst.*, 1943, 45: 971.

A long-term survey of the end-results of low-dosage irradiation of the pituitary gland and ovaries in amenorrhea and in dysfunctional uterine bleeding, with or without sterility, is presented. Of 249 patients treated between 1927 and 1937, inclusive, 136 were followed up for periods ranging from three to thirteen years.

This method of treatment resulted in restoration of normal menstrual function in 71 per cent of 51 amenorrheal women, 78 per cent of 37 oligomenorrheal patients, 57 per cent of 7 hypomenorrheal women, 59 per cent of 27 menorrhagic women, and 50 per cent of 10 metrorrhagic women. Four patients with primary amenorrhea were unaffected by low-dosage irradiation therapy. The percentage

of cures for the group of 136 as a whole was 66. Two patients were temporarily made worse and the remaining 44 were either unaffected or only temporarily relieved.

The restoration of menstrual function in 57 of the patients with associated sterility materially aided 34 of them in becoming pregnant. Of the 90 pregnancies in 54 women of the group of 136, 80 resulted in full-term healthy offspring; 7 pregnancies terminated during the first trimester and 3 terminated in stillbirths near term.

From this long-term follow-up it appears that preconceptional low-dosage irradiation to the pituitary gland and ovaries has no deleterious effect upon the generative organs or upon the offspring of the first generation. EDWARD L. CORNELL, M.D.

Rheindt, R.: X-ray Irradiation of the Myomatous Uterus in the Second University Gynecological Clinic in Vienna and Results for the Period from 1930 to 1939 (Roentgenbestrahlungsmethode an der II. Universitaets-Frauenklinik in Wien bei Uterus Myomatosus und die Ergebnisse aus den Jahren 1930–1939). *Zbl. Gyn.*, 1942, 66: 364.

In regard to the treatment of uterine myomas, the following policy is followed by the author:

If the diagnosis is uncertain or a suspicion of malignant degeneration is justified, an operation is performed; a surgical procedure is also advised if the tumors are very large. Irradiation of the ovaries is employed in women in the climacterium or close to it. Curettage always precedes the application of x-rays, in order to eliminate cancer of the fundus.

As to the factors, the skin-focus distance is 35 cm.; 0.4 mm. of copper plus 1 mm. of aluminum are used as filter; the dimensions of the irradiated field are 11 by 20 cm.; and 180 kv. and 6 ma. are used. The dose is measured with a measuring chamber introduced into the vaginal vault. One hundred and forty roentgens are applied each time to the abdominal and dorsal fields.

X-ray castration therapy was employed in 311 cases. No follow-up examinations could be done in 49 patients, or 15.7 per cent; some other patients did not come for the final check-up so that only 203 cases, or 55.3 per cent of the entire material, can be reviewed.

Of these patients 19.2 per cent were never pregnant, 7.4 per cent had abortions only, 46.5 per cent were multiparas, and 26.9 per cent had only 1 delivery. Thirty-one patients were single. Metrorrhagia was recorded in 45.5 per cent and menorrhagia in 38.1 per cent of the cases; 16.4 per cent had no abnormal hemorrhages but complained of backache, dysuria, and enlargement of the abdomen.

As to the results of the therapy, in 24.8 per cent of the followed-up material an immediate amenorrhea followed the irradiation; in 27.9 per cent the hemorrhage reappeared once, in 22.5 per cent twice, and in 15.3 per cent more frequently. Marked hemorrhages were stopped in 90.5 per cent of the followed-up material.

In 34 patients who gave a history of grave and obstinate hemorrhages, a supplemental irradiation of the spleen followed the treatment of the ovaries; in 19 cases an immediate amenorrhea resulted from the treatment.

In 24 cases a repetition of the treatment was necessitated by continuation of the bleeding. The second treatment failed in 5 patients.

In 72.3 per cent of the followed-up material the size of the uterus became normal after the treatment, in 12.3 per cent a marked shrinkage was noticed, and in the remaining 3.5 per cent the size of the uterus did not change.

Inasmuch as the majority of the patients were already in the climacteric stage, no symptoms of menopause followed the treatment; however, in 51 patients the symptoms were so pronounced that an irradiation of the hypophysis was necessary; in a small percentage of cases drugs had to be administered. JOSEPH K. NARAT, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Cornbleet, T., Kirch, E. R., and Bergeim, O.: Excretion of Thiamine, Riboflavin, Niacin, and Pantothenic Acid in Human Sweat. *J. Am. M. Ass.*, 1943, 122: 426.

Heat sweat was found to contain an average of 130 micrograms of thiamine, 120 micrograms of riboflavin, 300 micrograms of pantothenic acid, and 200 micrograms of nicotinic acid. It is possible that these values may be slightly higher than the true values for sweat as secreted by the glands because of the difficulty of entirely avoiding concentration due to evaporation on the skin surface. These values per liter correspond for thiamine to about 5 per cent of intake on a good diet, for riboflavin and pantothenic acid to about 3 per cent, and for nicotinic acid to about 0.5 per cent. For average American diets the percentage would be more nearly 10 per cent for thiamine, 5 per cent for riboflavin, and 1 per cent for nicotinic acid.

The excretion of such amounts of these vitamins cannot be said to be negligible from the physiological standpoint, although perhaps they become of importance only in cases of rather profuse sweating or on diets low in these vitamins. The elimination of nicotinic acid could hardly be of importance in any case. The losses of the other vitamins are of the same order as losses reported for ascorbic acid in sweat. Since favorable results have been reported in the administration of ascorbic acid in cases of profuse perspiration, it is possible that supplements of other vitamins might be worthy of trial under similar conditions. Ingestion or intramuscular injection of large amounts of these vitamins did not lead to any noticeable or persistent increase of their secretion in the sweat.

These vitamins as found in sweat appear to be a true excretion not appreciably influenced by bacteria on the skin. Sweat contains sufficient of these vitamins to promote bacterial growth provided conditions are otherwise favorable. Thiamine appears to exist in sweat only in the free form.

JOHN J. MALONEY, M.D.

Clinton, M., Jr., and Thorn, G. W.: The Effect of Desoxycorticosterone-Acetate Administration on Plasma Volume and the Electrolyte Balance of Normal Human Subjects. *Bull. Johns Hopkins Hosp.*, 1943, 72: 255.

The effect of the intramuscular and sublingual administration of desoxycorticosterone acetate, with and without supplemental sodium chloride, was studied in a special group of normal subjects. Blood chemical analysis, hematocrit cell-volume, red blood-cell, and plasma-volume determinations were made on blood obtained under basal conditions. In addition, the concentrations of sodium and chloride were

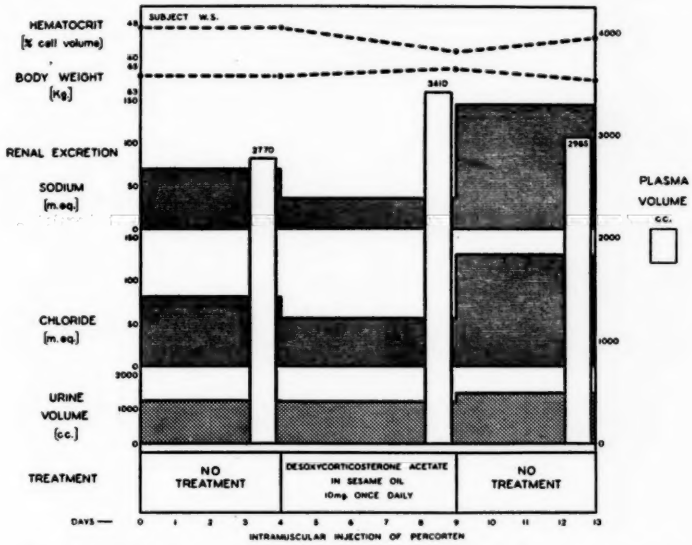


Fig. 1. Chart showing the effect of intramuscular administration of desoxycorticosterone acetate on the plasma volume and electrolyte balance.

determined in twenty-four-hour urine specimens. In every case receiving daily intramuscular injections, the plasma volume increased an average of 17.5 per cent. The maximum increase in volume change was reached on the fourth day of therapy. With the increase in plasma volume, a retention of sodium and chloride electrolytes occurred and averaged 170 m. eq. and 92 m. eq., respectively. An increase in weight of about 0.4 kgm. was also noted in each subject. Discontinuation of therapy was followed within three days by a return of the plasma volume, and of the sodium and chloride concentrations to their original pretreatment values.

These changes also occurred after the administration of desoxycorticosterone acetate sublingually, but this manner of administration was not as markedly effective as muscular injection. The supplemental addition of sodium chloride did not enhance the action of the hormone. Control experiments in which sodium chloride alone was administered served to increase the plasma volume slightly. No deleterious effects followed the use of synthetic adrenal hormone even when continued for a period of fifteen days. BENJAMIN G. P. SHAFIROFF, M.D.

Richman, M. J., and Abarbanel, A. R.: Effects of Estradiol, Testosterone, Diethylstilbestrol, and Several of Their Derivatives upon the Human Oral Mucous Membrane. *J. Am. Dent. Ass.*, 1943, 30: 913.

The oral cavity may offer many clues to the metabolic and nutritional status of the patient. The authors report a series of 25 climacteric cases in which gross oral manifestations, subjective symptoms, and biopsies of the buccal mucosa were correlated before, during, and after therapy with estradiol diproprionate, estradiol benzoate, diethylstilbestrol, diethylstilbestrol monomethyl ether, testosterone propionate, and methyl testosterone. As far as the oral response was concerned, the intramuscular or subcutaneous route proved to be much slower and far less effective in achieving the desired result as compared with the local injection of estradiol diproprionate under the mucobuccal fold.

As a result of declining ovarian activity, manifested clinically by the cessation of menstruation, atrophic changes similar to those developing in the vulvovaginal tract may occur in the oral mucosa. The authors emphasize that not all women develop postmenopausal atrophy of the buccal mucosa.

Objectively, the normal pink fades, and the mucosa becomes pale and anemic looking. Grayish white areas appear in patches or streaks, or are diffusely scattered. Finally, a whitish adherent film may be noted in some areas. Subjectively, and concomitantly with these gross changes, a sensation of dryness or flatness of taste, or of burning, may be observed by the patient. Gingival bleeding may be noted in some cases. Histologically, the first stage consists of atrophy of the germinal layer in general and the prickle cells in particular. With time and irritation, the corneous layer, under an abnormal growth stimulus, may become the site of hyperkeratosis or, eventually, leucoplakia.

After therapy with estradiol or diethylstilbestrol, the following changes occur:

Grossly, the normal bright moist pink of the oral mucosa returns. Subjectively, the symptoms of burning and dryness disappear, while an increase in salivation is noted in some cases. Gingival bleeding no longer is noted. Histologically, there occurs a physiological hyperplasia of the prickle-cell layer, increased activity of the basal cells, and, in some cases, a smooth, even keratinization of the corneous layer. At no time was hyperkeratosis induced by administration of these estrogens. In fact, in a few instances, leucoplakic areas seemed to diminish in size.

The vulvovaginal mucosa responds to estradiol and diethylstilbestrol therapy with changes histologically similar to the changes occurring in the oral mucous membranes.

The management of senile atrophic gingivitis with estradiol dipropionate administered by injection under the mucobuccal fold was found to yield the most satisfactory results. Bleeding from the gums was arrested and the mucosa was restored to its normal condition. LOUIS T. BYARS, M.D.

Carleton, E. H., and Kammer, A. G.: Heat Sickness. *Rocky Mountain M. J.*, 1943, 40: 384.

There is physiological adaption of the body to increased environmental heat which involves water and electrolyte balance, increase of the blood flow through the portion of the vascular bed in the skin, and the regulatory function of what is probably a heat control center in the hypothalamus.

An individual subjected to a prolonged exposure in a hot environment places his entire adaptive mechanism under a stress. The mechanism may show failure at one or another of its principal points. Marked reduction in plasma chloride may be associated with painful contractions of the skeletal muscles. The increased demand for blood flow through surface capillaries may lead to a state of exhaustion simulating shock, and a loss of stability at the heat control center may cause varying degrees of hyperthermia.

For several years heat sickness has been classified as cramps, heat exhaustion, and hyperpyrexia, but the authors agree with those who find that the majority of heat cases present a picture far from uniform, frequently confusing, and with physical findings varying only in slight degrees from normal. In the authors' 271 cases, there were 18 instances of simultaneous heat cramps and exhaustion. Visceral cramps may occur with cramps in the skeletal muscles, but when abdominal cramps occur alone, some other condition must be the cause.

The diagnosis of heat sickness in any one of its manifestations requires caution and good judgment. Hasty decisions should not be made merely on the basis of histories of exposures. Care needs to be exercised in ruling out diseases which heat sickness may simulate.

Treatment should be directed at those points of the adaptive mechanism which apparently have failed. Certain general measures benefit all cases: rest in a cool room, sponging of the body surface with tepid water, and generous quantities of chilled normal saline solution by mouth.

Much can be accomplished by prophylactic measures. Workmen should be taught to maintain a high salt intake, a well balanced diet, and certain basic practices of personal hygiene. Buildings and other working places where workmen are exposed to high heat and/or humidity should be designed originally, or altered if possible, to provide for easy escape of heat-laden air and for circulation of air currents.

MARIAN BARNES, M.D.

Page, R. C., and DeBeer, E. J.: The Production of Cysts Following the Intramuscular Injection of Vegetable Oils. *Am. J. M. Sc.*, 1943, 205: 812.

Although endocrine substances and certain drugs for intramuscular injection are commonly used in oil, there are relatively few published cases citing any ill effects. The authors undertook to study which of five oils—corn, cottonseed, sesame, olive, and peanut—was least harmful when inoculated intramuscularly. They also studied mixtures of these oils with diethyl ether.

The oils were inoculated into white rats. The animals were examined over periods varying from seven to forty days. There seemed to be little choice between the oils. In only 7 of 54 possibilities were no cysts found. In these 7 a thin cyst wall may have been broken. The ether solutions produced less intercystic tissue and, in general, the cysts appeared to be smaller and with thinner walls. This probably was due to the greater ease of administering the thinner solutions. MARIAN BARNES, M.D.

Ackerman, L. V., and Eberhard, T. P.: The Treatment of Tumors by Escharotics. *J. Missouri M. Ass.*, 1943, 40: 163.

The treatment of cancer by escharotics is as old as the practice of medicine itself. Like in many other therapeutics, unscientific and uncontrolled use of the agent (escharotics in this case) is dangerous, and the development in other fields of more refined methods in the treatment of tumors has diminished the elements of value in this method. Recently, however, Mohs has revived interest in the use of an escharotic, i. e., zinc chloride, and has developed it to a high degree of perfection. He emphasizes that the method is utterly unsuited for use in the private office and the small hospital. It should not be used by anyone unless he can maintain a staff of trained and competent assistants and have adequate control facilities.

Any substance which will penetrate keratin and devitalize protein can be used for "chemosurgery;" however, nitric, sulfuric, and ditrichloroacetic acids, potassium hydroxide (caustic potash), antimony chloride, arsenic trioxide, and zinc chloride are used most commonly. Zinc chloride, used properly, possesses the advantage of "fixing" tissue in the same manner as formalin, leaving it suitable for histological sectioning and staining.

The course of paste-treated lesions when uncontrolled by pathological study is remarkably uniform. The initial tumor may be small. After zinc chloride is applied locally, a large area of slough appears, but the lesion eventually heals over. The wide area of destruction with secondary fibrosis, caused by the paste, often results in marked disfigurement. After apparent healing there may be cure, but if the lesion has any depth, recurrence is the rule. This quiescent period may vary from a few weeks to several years before the deep-lying tumor in the matrix of the scar tissue again begins to grow and ulcerate. Microscopically, paste lesions show fairly uniform pathological alterations. Ulceration of the overlying epithelium, marked acute and chronic inflammation, and extensive fibrosis are present. In the deeper tissues and usually at the periphery of the ulceration, actively growing tumor may be seen. Skin appendages may still be present.

From the standpoint of further therapy, these changes are of great importance. The dense, sclerotic, avascular tissue is almost as subject to radiation necrosis as is previously irradiated tissue. Even after surgery, unless it is possible to excise well around the scarred area, the wounds heal as inadequately as after intensive irradiation. The still viable cancer cells have increased radioresistance, although not to such a degree as those previously irradiated.

Thirty-nine cases previously treated by paste have been collected by the authors. Twenty of these had been treated by a miscellaneous unorganized group of charlatans. The remaining 19 had received treatment at a sanitorium condemned by the American Medical Association. From the review of these cases the authors conclude that "chemosurgery," as Mohs calls it, has a very limited but very definite field of usefulness. However, zinc chloride should not be used without the painstaking technique and elaborate laboratory controls of Mohs. Except in a few instances, it accomplishes nothing that cannot be equally well or better done by irradiation or surgery. It is still a method of local attack, which offers a chance of eradicating cancer with a minimum sacrifice of normal tissue. At times, this may be of extreme importance, such as in the region of the ethmoid sinuses where wide block dissections, the only type known to offer reasonable hope of arrest, often cannot be done. Irradiation of cancer in the bones of this or any other region is fruitless. In such cases paste might be used without the fear of trauma, hemorrhage, or mechanical spread, and might enable one to follow the tumor to its termination a tenth of a millimeter at a time. Zinc-chloride treatment offers a small percentage of patients with such lesions a chance which they would not otherwise have. The same is true of patients with lesions in the region of the facial nerve, ear, mastoid, and great cervical vessels. The authors do not believe this method has a practical place in the treatment of superficial lesions

which may be readily controlled by irradiation or surgery, nor in the treatment of deep-seated visceral tumors. It should never be used in the treatment of breast tumors. JOSEPH K. NARAT, M.D.

Steiner, P. E.: The Incidence of a Carcinogenic Factor in the Livers of Cancer, Noncancer, Cirrhotic, and Negro Patients. *Cancer Res.*, 1943, 3: 385.

It has been previously reported that extracts prepared from the human liver when injected into mice produce tumor at the site of injection. Tumors have been produced in this manner from the livers of patients dying of neoplasm, as well as of patients dying from other causes and whose livers were apparently normal. The present work is a survey of the incidence of carcinogenic activity in extracts prepared from various kinds of human livers. It is based on extracts from 67 cases tested in 896 mice. Thirty-seven of the patients had a malignant tumor and 30 died from noncancerous diseases. Twenty-seven of the 37 patients had no metastases either grossly or microscopically.

The extract was prepared by grinding the livers and by saponification with alcoholic potassium hydroxide and repeated extraction with ethylene dichloride.

These extracts were then placed in an oil of sesame or tricaprylin. These solvents have been tested and found not to induce tumors. A small amount of the extracts, from 300 to 500 mgm., was then injected into mice. An average of 15 mice was employed for each extract. Twenty-two sarcomas were induced at the site of injection by 14 of the 67 extracts. Since 746 mice survived the induction period of six months, the yield of tumors was 2.9 per cent. Of the 167 mice left at the end of the six months in the 14 experiments in which sarcomas were produced, 13.1 per cent subsequently developed sarcomas. The sarcomas appeared in six months.

Of the 14 positive extracts, 8 were obtained from cancer patients, while 6 were obtained from noncancer patients. The incidence of the carcinogenic factor was about equal at all ages, in the 2 sexes, in negroes and whites, and in cirrhotic and noncirrhotic livers. J. GARROTT ALLEN, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Tuscher, R. M.: Clinical and Bacteriological Studies on the Tonsillar Origin of Focal Infections; Diagnostic Method Utilizing Streptococcal Cutaneous Allergy and Its Results (Recherches cliniques et bactériologiques sur les origines tonsillaires dans les infections focales; essais d'une méthode de diagnostic par l'allergie cutanée streptococcique et ses résultats). *Rev. méd. Suisse rom.*, 1942, No. 12: 903.

If a detailed clinical history is taken and the patient is carefully examined, the customary diagnostic measures will detect a focal infection in the tonsils in 80 per cent of cases. In some instances, however, only bacteriological studies combined with an investigation of the allergy of the skin will lead to a correct diagnosis. In some cases lymphopenia after a massage of a normal tonsil, leucocytosis with lymphopenia after massage of a diseased tonsil, and shift of the leucocytic formula to the left may facilitate the diagnosis, which is corroborated by the intradermal reaction.

Latent focal infection nearly always produces a streptococcal allergy. If the history, clinical aspect of the tonsils, sedimentation rate of the erythrocytes, and shift of the leucocytic formula to the left point to an infection of the tonsils, a complete, and not partial, tonsillectomy should be performed.

The intensity of secondary foci of infection is a result of streptococcal allergy, and not only a clinical but also a bacteriological cure may be expected after elimination of the source of allergy.

A partial tonsillectomy is liable to intensify the streptococcic allergy and therefore should be abandoned. JOSEPH K. NARAT, M.D.

Wolfe, H. R. I.: Hydatid Disease in Wales. *Lancet*, Lond., 1943, 244: 795.

Thirty-four cases of hydatid disease reviewed by Wolfe were treated in the Royal Infirmary, Cardiff, from 1926 to 1938, and, taken together with statistics from the Registrar-General's Office, suggest that the disease is more common in Wales than elsewhere in Great Britain. Eleven of the cases came directly under the supervision of the author. The common source of infection is the dog, which becomes infested by feeding on the offal of sheep. Ineffective supervision of some of the abattoirs in South Wales provides a means for dogs to get at the offal. In this series of cases, histories obtained from 27 of the 34 patients strongly suggest direct contagion; 9 had a history of close association with dogs, 3 were fond of watercress and lettuce, and 10 admitted both factors; 5 denied both factors. Seven of the patients who sought treatment were under twenty years of age, 14 were between twenty-one and forty years old, 10 were between forty-one and sixty years old, and 3 patients were over sixty. The age at which the patient sought treatment is no criterion of the age of the infection, which is usually great, as frequently the degree of incapacity from it is slight. The age of the cyst can be inferred from multivesiculation (which increases with age), sterility, calcification, or complications (rupture, suppuration).

The distribution of the cysts was as follows: liver, 27 cases; lung, 5; spleen, 1; muscles (abdominal wall) 1; brain, 1; and extradural region, 1. The cysts tend to grow quite large before they produce symptoms. Eighteen of the 34 cases were diagnosed correctly before operation. In the patients with liver and lung cysts, the size and shape of the tumor, and x-ray investigations aided in the diagnosis; the Cassoni intradermal test, the hydatid complement-fixation test, and the differential leucocyte count were of additional value.

The mortality was 16 in this series: 4 from complications of the cyst, 8 from postoperative complications, and 4 from intercurrent infection. The mortality was especially high in patients over forty. The treatment varied too considerably to justify conclusions. Generally, all cysts which can be excised should be removed. Wolfe advocates the routine injection of 1–2 per cent formalin into cysts, except those of the central nervous system.

Wolfe believes that the success achieved in other countries in stamping out hydatid disease can be duplicated in Wales by such measures as education of the public, control of the number of dogs, and more stringent regulations in abattoirs concerning the disposal of offal. EDWIN J. PULASKI, M.D.

Bergeim, O., and Cornbleet, T.: The Antibacterial Action of the Lactic Acid and Volatile Fatty Acids of Sweat. *Am. J. M. Sc.*, 1943, 205: 785.

Bergeim and Cornbleet studied the role of the volatile fatty acids in sweat as regards their pH and acid concentrations and with relation to antibacterial activity. The sweat specimens were collected from human subjects encased in a rubber bag and seated in a heat cabinet. Analysis of the specimens included the total volatile fatty acids, the nature of the acids, the lactic acid, the ammonia, and the pH. The acid which was present in largest amounts in sweat was lactic acid (about 0.1 per cent). This amount of acid per se has a low sterilizing value with regard to most organisms, especially if the pH is above 5. Its concentration is increased by evaporation of the sweat, and the bactericidal action is then more effective, and especially if there is a corresponding fall in pH to below 5.3. The skin appears to secrete lactic acid as such, and the volatile fatty acids appear to be largely formed from the lactic acid.

In 24 cases studied the pH of the sweat varied from 5.1 to 6.95, with an average pH of 5.7. Evaporation of the sweat tended to lower the pH and increase the lactic-acid content, as this acid is not volatile. At the same time, however, the skin bacteria apparently convert some of the lactic acid to volatile fatty acids while the organic nitrogen compounds, especially urea, are converted to ammonia. This ammonia has a neutralizing effect on the acids. On the other hand, since ammonia is more volatile than lactic acid, on evaporation of the sweat, much of the ammonia is lost and the lactic acidity is regained. Most of the volatile acids are formed on the skin from lactic acid, probably by bacterial action, as is indicated by the fact that on incubation the fatty acids—originally present in negligible amounts—rise, and the lactic acid decreases to about the same extent. No study was made of the bacteria concerned. Incubation of sweat made sterile by Berkefeld filtration caused no decrease in the lactic acid nor any increase in volatile acids.

Lactic acid with a pH above 5.3 is so completely ionized that few undissociated molecules of acid, on which much of the antibacterial action of the acid must depend, are present. The chief value of this acid is present, therefore, when the pH is below 5.3. The volatile acids are less dissociated and hence more effective in the pH range of from 5.3 to 6.2. Their most important role would appear to be the extension to some degree of acid protection in these higher pH levels which also exist on the skin, as in the axillae, under certain conditions.

EDWIN J. PULASKI, M.D.

Talbot, T. R., Jr., and Adcock, J. D.: Febrile Reactions Resulting from the Readministration of Sulfadiazine. *Am. J. M. Sc.*, 1943, 205: 841.

Although sulfadiazine is recognized as causing fewer unfavorable reactions than sulfanilamide, sulfathiazole, or sulfapyridine, the observation of several patients who exhibited unfavorable reactions to it caused the authors to make a survey of its effects in their patients. They selected 20 clinical cases and 17 experimental cases. Each group received two courses of the drug. The first course of the experimental cases totaled 18 gm., and the duration of the first course varied from two to thirty days. The second course was started in from eight to fifty days. All their results are carefully tabulated.

The most frequent manifestations of a reaction were, in addition to fever, chills or a sensation of chilliness, diffuse skin eruptions, severe malaise, and toxic psychoses. The symptoms and signs all appeared, as a rule, within a few hours after starting the second course.

Of the 37 patients, 6, or 16.2 per cent, had fever during the second course; 3, or 8.1 per cent, reacted to both the first and second course; and 3, or 8.1 per cent, reacted to only the second course. Once a reaction occurred, the fever persisted for from twelve to forty-eight hours.

Although their figures are admittedly too few for statistical analysis, the authors believe they suggest that it is the prolonged administration of the drug that leads to development of sensitivity, although readministration to patients who had had a short course sometimes also led to reactions. They believe that the drug should be given only in cases which justify its use. MARIAN BARNES, M.D.

Stewart, S. E.: Active Immunization of Human Beings with Combined Clostridium Perfringens and Tetanus Toxoids. *War Surg.*, Chic., 1943, 3: 508.

By using concentrated clostridium-perfringens toxoid suspended in plain tetanus toxoid, combined immunization, as evidenced by antitoxin titrations, has been demonstrated both in guinea pigs and in human beings. The antitoxin response to tetanus toxoid is greater when the toxoid is given in combination with clostridium-perfringens toxoid than when it is given alone.

According to previous work, guinea pigs so immunized show an ability to withstand large doses of a living culture of clostridium-perfringens inoculated intramuscularly. On the basis of analogy, there is

reason to believe that the same might be the case in human beings, in whom chance infection probably does not involve many spores. SAMUEL KAHN, M.D.

DUCTLESS GLANDS

Poate, H. R. G., Bartholomew, R. J., and Wilson, T. E.: The Hippuric-Acid Test in Thyreotoxicosis. *Med. J. Australia*, 1943, 1: 481.

The authors discuss the results of 183 hippuric-acid tests on 133 patients with diseases of the thyroid gland, together with the results of 43 hippuric-acid tests on 40 other patients. In many of these cases the basal metabolic rates and the blood cholesterol, bilirubin, and prothrombin levels were also estimated, but it was not possible to prove the existence of a relationship between the results of any of these tests, the age and the sex of the patients, the duration of the symptoms, and the postoperative reaction.

It is shown that if the cases of female patients suffering from thyreotoxicosis are grouped on a pathological basis, as (1) acute thyreotoxicosis (hyperplastic thyroid), and (2) toxic adenomatous thyroid, then these two groups differ significantly from each other as to the age of the patients, duration of the symptoms, and response to the hippuric-acid test, and in either series these factors of age, duration of symptoms, and conjugation and detoxication are probably unrelated. It is therefore concluded that patients with toxic adenomatous thyroids show greater impairment of the conjugating and detoxicating function of the liver than do patients with acute thyreotoxicosis, and that this difference is not entirely due to the longer duration of symptoms or to the increased age of the former group of patients.

In the 9 fatal cases of thyreotoxicosis in this series, the results of the hippuric-acid test were not proportional to the changes in hepatic structure, nor was there any relationship between the results of the hippuric-acid test and the pathological changes in the thyroid gland in those cases in which this gland was removed at operation or autopsy.

It is concluded that impaired liver function is not the sole cause of thyroid crises, and that it is not possible to determine in which cases these crises will develop from preoperative hippuric-acid tests.

The authors do not wish to convey the impression that the hippuric-acid or any other test has usurped clinical judgment in the treatment of thyreotoxicosis; rather, these tests are subservient to it. The chief uses of the hippuric-acid test in thyreotoxicosis would appear to be in confirming the beneficial effect of preoperative treatment and in helping to establish the unsuitability of some patients for operation, especially many of those elderly patients with toxic adenomatous thyroids in whom the toxic state has existed for several years. J. M. MORA, M.D.

Morison, J. E.: Bilateral Adrenal Hemorrhage. *Lancet*, Lond., 1943, 244: 800.

Morison reports 3 cases of fulminating septicemia, characteristic of the Waterhouse-Friderichsen syndrome, which came to autopsy. The clinical manifestations of this syndrome include restlessness, headache, and abdominal discomfort with vomiting and diarrhea (usually in patients under two years of age), which progress rapidly to convulsions and stupor, often with cyanosis. Petechial hemorrhages of the skin which do not fade on pressure are found in most cases if looked for. In a few cases a marked leucocytosis has been noted.

At autopsy the adrenal glands, both the cortex and medulla, showed widespread destruction by confluent extravasation of blood. In addition, there were well marked edema and small hemorrhages in the pericapsular tissue. There was no ante-mortem thrombosis. Skin petechiae were present in 1 case. Apart from the adrenal lesions, all the cases showed a widespread edema of the interstitial tissues, edema fluid in the lung alveoli, sequestration of red blood cells in dense masses in overdistended minute blood vessels, and slight swelling of endothelial cells.

These lesions are similar to the ones described in shock and in many acute bacterial infections. Probably in the cases described, the widespread hemorrhages can be attributed to the rupture of overdistended capillaries damaged by bacterial toxins and by anoxemia resulting from stasis.

Thus, the author suggests that the structural changes found throughout the body result from peripheral vascular failure and resemble shock. He believes that they should be regarded as a consequence of bacterial toxemia and not of adrenal hemorrhage. Accordingly, in addition to chemotherapy, treatment similar to that for post-traumatic shock should be given in fulminant bacterial infections.

EDWIN J. PULASKI, M.D.

Hyman, A., and Mencher, W. H.: Pheochromocytoma of the Adrenal Gland. *J. Urol.*, Balt., 1943, 49: 755.

Tumors of the medullary portion of the adrenal gland are divided into two types: those that produce hormonal symptoms and those that do not. Both types of tumors arise from the same cells, namely, the sympathogonia. These cells differentiate into two types: the future ganglion cell and the pheochromocyte (hormonal type). It is the latter type of cell which is found in the tumor discussed in this article.

The pheochromocytoma does not necessarily occur only in the medulla of the adrenal gland, but may be found wherever chromaffin tissue is present, as behind the peritoneum, in the carotid body, along the abdominal aorta, in the organ of Zuckerkandl, and in the sacrococcygeal region. These tumors vary in size from a few millimeters to several centimeters, and the larger tumors are red as compared to the smaller which are gray. The tumor is often characterized by hemorrhage, cyst formation along with degeneration, and necrosis. Histologically, the tissue is characterized by polyhedral cells with finely granular and basophilic cytoplasm, the nuclei of which vary in size, and the tumor becomes characteristically dark brown in appearance when im-

mersed in dichromate solution. The stroma of the tumor is primarily thin connective tissue.

It is noted that there have been 35 cases reported in the literature which have undergone surgery, and the present article presents 4 of this group. In this group there have been 5 postoperative deaths and another patient died two years following surgery due to metastasis. It was noted in the combined series that the condition occurred more frequently in women, and in 4 instances the tumor did not involve either adrenal gland.

The patient's symptoms are presumably due to a sudden discharge of adrenaline or an adrenalinelike substance into the general circulation. The attacks are of variable duration, from minutes to hours, and begin often with the patient complaining of a marked pounding headache, nausea, dyspnea, orthopnea, palpitation, blanching of peripheral portions of the body, paresthesias, abdominal cramps, vomiting, precordial throbbing, and marked weakness. The attack is terminated with flushing of the previously blanched areas, profuse perspiration, and weakness. Death may occur because of shock, pulmonary edema, failure of the left part of the heart, and coronary disease, or with cerebral manifestations. The unchecked vascular tension if unrelieved by surgery may induce ateriolar sclerosis and, thus, permanent hypertension.

As noted previously, the attacks may be spontaneous or induced by any mechanism which induces an adrenaline discharge. Such causative factors include emotional upset, fear, slight trauma, postural change, exertion, hyperventilation, pressure on the tumor from position, and massage of the tumor or abdomen, histamine or adrenaline administration, and sudden immersion of the extremities in cold water.

In the hypertensive phase the systolic pressure may rise over 300 mm. and the diastolic over 100 mm.; the pulse is markedly thin and impalpable. The arterioles of the nail beds and fundi show constriction, and the carotid may even be constricted so that pulsation is hardly palpable. Because of the reduced peripheral blood flow there is a diminution in skin temperature. Since a large amount of adrenaline is introduced into the blood, shock may ensue if this is continued over a long period of time.

Blood studies show a diabetic type of sugar-tolerance curve and the blood volume is low. The blood also demonstrates the presence of pressor substance. The urine, though negative between attacks, demonstrates during the episode a reduced volume, albumin, and red cells; and casts and glycosuria are present on occasion.

Pyelography may demonstrate a compression of the upper pole of the kidney; however, when the tumor is small it may be diagnosed by perirenal insufflation. The authors note that this latter procedure is not as hazardous as the literature indicates.

A diagnosis of pheochromocytoma is dependent upon: (1) the typical attack with the typical clinical findings; (2) evidence of pressor response to one or more stimuli; (3) the demonstration of pressor substance in the blood; and (4) the roentgenographic demonstration of tumor by perirenal insufflation of gas.

The authors advise basal anesthesia for the operation to avoid exciting the patient, and cortical hormone and adrenaline to prevent the drop in adrenal products due to the loss of the adrenal gland and the tumor. It is suggested that for small tumors a lumbar approach be used with excision of the twelfth and eleventh ribs, if necessary, but in the event of a huge tumor it should be approached transperitoneally. During the operation the patient must be watched closely since the sudden removal of the tumor may produce a sudden drop in the blood pressure. In the event of collapse, intravenous infusions, adrenaline given intravenously and in oil, adrenocortical extract, and desoxycorticosterone are valuable agents. Bio-assay of the tumors shows large quantities of pressor substances.

Four cases of pheochromocytoma of the adrenal gland are presented; 3 occurred in women and the fourth occurred in a male. All the tumors were removed successfully and the follow-up revealed all patients to be in good health with no recurrence of attacks. The cases are discussed completely from both the preoperative and postoperative standpoints.

ROBERT LICH, JR., M.D.

EXPERIMENTAL SURGERY

Goldman, L.: Intestinal Strangulating Obstruction with Negative Roentgenological Findings. *Surgery*, 1943, 13: 834.

Two cases of internal strangulating obstruction and gangrenous bowel without x-ray evidence are reported. Strangulating obstruction may be present with the x-ray films suggesting adynamic ileus. In 10 dogs the sudden production of strangulating obstruction to a loop of small intestine produced x-ray evidence of intestinal obstruction. Gaseous distention was not observed in the roentgenograms of 25 per cent of 20 dogs in which strangulating obstruction was produced by gradual interference with the blood supply and later with the wall of the bowel itself.

Clinical and experimental observations suggest that the absence of evidence of intestinal obstruction in plain roentgenograms may not rule out the possibility of intestinal strangulating obstruction.

J. M. MORA, M.D.

Popper, H. L., and Necheles, H.: A New Test for Pancreatic Function. Experimental Observations. *Gastroenterology*, 1943, 1: 490.

A number of procedures have been used for the diagnosis of pancreatic disorders. These have included glucose metabolic tests, systematic determinations of amylase in urine and blood serum, serum lipase determinations, and examination of the duodenal juice after stimulation of the pancreatic secretions by oleic acid or other substances. Each of these tests in some cases has reflected to some extent the functional capacity of the pancreas. However, none

has served adequately as a diagnostic means for detecting pancreatic disease.

The authors have developed a test which may be performed on patients for determining the functional capacity of the pancreas. The test is based on the fact that stimulation of the external secretion of the pancreas is followed by changes in the level of certain enzymes of the serum. The test requires the injection of certain drugs to stimulate pancreatic secretion and the withdrawal of several small samples of blood for determining the serum amylase or lipase. Acetyl-beta-methylcholine hydrochloride injected by itself or with eserine is followed by a rise of serum amylase in the normal dog. In the pancreatectomized dog and in the dog whose pancreatic ducts have been ligated some days previously, little or no rise occurs. This rise in serum amylase following vigorous stimulation of the external pancreatic secretion is thought to be due to the large increase of pancreatic secretion, and the entrance of part of it into the blood stream.

On this assumption this test was performed on a group of experimental animals. It was found that optimal results were obtained when from 0.025 to 0.05 mgm. per kgm. of eserine sulfate and 0.025 mgm. per kgm. of the methylcholine were injected subcutaneously and the doses were repeated after an interval of fifteen minutes. When this combination of drugs was given to dogs with experimental atrophy of the pancreas no rise in the blood amylase or lipase was noted, although in the normal animal there was a sharp rise. The authors suggest that while the dosages of these drugs is probably too large for human use it may be possible, through substitution or alteration of the size of the dose, to employ this test in man, and that such a test may reveal the presence of chronic pancreatic disease.

The authors also employed optimal dosages of secretin for provoking a marked increase in the flow of pancreatic juice. Under these conditions serum lipase yielded more significant results than did amylase. A rise of serum amylase following the injection of secretin could be found for several weeks after ligation of the main pancreatic duct, whereas fasting lipase levels in the same animals were usually not increased after the tenth to fifteenth postoperative day. These data suggest that the determination of serum lipase after secretin stimulation is more apt to reveal the presence of pancreatic disease than when the usual serum enzymes are determined without stimulation.

J. Garrott Allen, M.D.

Scheman, L., Lewin, P., Sideman, S., and Janota, M.: Experimental Osteomyelitis. *Am. J. Surg.*, 1943, 60: 371.

The authors discuss the results following the experimental production of hematogenous osteomyelitis in rabbits and dogs.

Staphylococcus aureus, originally cultured from a child with hematogenous osteomyelitis, was used as the etiological agent. Sodium morrhuate was injected into the metaphysis of the tibia, and this was followed a half hour later by injection of the organisms into the same metaphysis. In some animals the organisms were injected intravenously. Rabbits were given a preliminary immunizing dose one week before; otherwise, most of them would have died from the disease. Dogs did not require the immunizing dose.

The resulting lesion was a panosteitis rather than a localized bone abscess. The morrhuate injection did not produce vascular thrombosis, but resulted in just enough bone necrosis to allow the organisms to set up an osteomyelitis. Thus the morrhuate necrosis provided the soil for the growth of the organisms and the production of infection, just as trauma or embolism does in man. When bone necrosis was not present, neither intravenous nor intrametaphyseal injection of staphylococci resulted in true osteomyelitis. The necrosis produced by the morrhuate was not severe and, unless infection supervened, complete regeneration occurred in about three and one-half weeks.

From the authors' experiments, the following facts were reaffirmed: (1) the firm attachment of periosteum at the epiphyseal line safeguards the neighboring joints; (2) the epiphysis is a strong barrier against spread of the infection; and (3) spread of infection to a joint is unusual, with exception of the hip joint.

The clinical picture of experimentally produced osteomyelitis exhibited an acute stage of the disease, with local swelling, pain, heat, and redness, but without early roentgenological findings, followed by subacute and chronic stages with definite roentgenological changes. The roentgenological pictures and the pathological specimens were comparable to those seen in human osteomyelitis.

Sulfathiazole given before, during, and after the development of osteomyelitis in the rabbit did not alter the course of the infection, the roentgenological findings, or the mortality rate. Furthermore, the animals receiving sulfathiazole became more debilitated than those in the control group. Cultures from the blood and bone were positive for the staphylococcus aureus.

The authors are continuing this admirable program of investigation and they urge further utilization of this simple and easy experimental method for the solution of the many current problems associated with the treatment of acute and chronic hematogenous osteomyelitis.

Edward W. Gibbs, M.D.

Allen, F. M.: The Theory and Therapy of Shock. Reduced Temperatures in Shock Treatment. *Am. J. Surg.*, 1943, 60: 335.

The author advocates abandoning the term "primary shock" and replacing it with "syncope", "vasomotor collapse" or any other expression that can be accurately defined. The single word "shock" he uses to denote the condition formerly called "secondary shock."

Suboxidation and increased capillary permeability (local or systemic) dominate the picture of shock from beginning to end, and lead to death by anoxia. The process which draws water and electrolytes into the tissue spaces from the blood, and possibly also from the cells, may be attributed to three possible causes: namely, an increased avidity of the tissues, a vital alteration in the capillary endothelium, or a shift of osmotic balance due to metabolic products either of the original injury or of suboxidation.

Several methods for the experimental production of shock are enumerated:

1. Slow or intermittent hemorrhage leading to final shock. Hemorrhage, however, cannot be dependably standardized; also, the hemorrhage itself is an independent disturbance and a complication of capital importance. Ashworth and Kregel's finding of a different partition of intracellular and extracellular water and electrolytes in hemorrhage and traumatic shock appears as a fundamental distinction.

2. Burns. Burn lesions cannot be exactly standardized.

3. Muscle trauma. Notwithstanding improved apparatus, it seems probable that because of the different conformation of different animals' legs, the standardization of muscle trauma is not very precise.

4. By tumbling animals in a wheel. This emphasizes the advantages of freedom from hemorrhage, anesthesia, and infection, but disregards the possibility of maximal psychic and nervous accompaniments of the mild physical trauma.

5. Tourniquets on limbs. The method of placing tourniquets on limbs was devised by the author, who used it because it involves only the recognized shock processes of reduced oxidation and increased vascular permeability. Nervous factors are excluded by the total paralysis of nerves. There is inflammatory edema, sometimes greater than with mechanical trauma, to suit the upholders of the physical theory, and asphyxial metabolic products to suit the upholders of the toxic theory of shock. Recovery can be complete without infection or the death of a single tissue cell. The standardization is most accurate and elastic, because it can be regulated by two variables, namely, the mass of tissue ligated, and the duration of ligation. The briefest possible ligation of the largest possible mass creates the least chance of hemorrhage, while at the opposite extreme, legs ligated for nine or ten hours are subject to bleeding which discolors the local tissues and may influence subsequent blood counts. This escape of blood, however, is a recognized feature of the vascular changes in the severest inflammation, and is thus different from the gross rupture of vessels by trauma.

Rats seem to suffer less tourniquet pain than human subjects, while dogs and cats seem to suffer even more, presumably because of their firm unyielding muscles. Therefore, full surgical anesthesia is indispensable, and in the present series this has been obtained with nembutal given intraperitoneally, reinforced with morphine subcutaneously in refractory animals, if necessary.

Local refrigeration was accomplished as usual by immersing the animals' legs in ice water while keeping the bodies warm and dry in a warm room with warm coverings, or, if necessary, with the addition of hot water bottles.

Surgeons will agree that shock which kills in about six hours is severe. It is not a mild or border-line condition. Therefore, a lengthening of life may have been the utmost that could be expected of such treatment. The differences were not trivial. In the series with local temperature changes, the heated animals lived for an average of five hours and forty-nine minutes, and the chilled ones for an average of eleven hours and twenty-four minutes.

Experiments included local chilling without the application of a tourniquet and local refrigeration with a tourniquet.

From the existing evidence it is possible to suggest the following rules:

1. A tourniquet should not be used without a positive indication or a planned purpose. One example is a permanent tourniquet to be left in position until after a hopelessly mangled limb has been amputated.

2. The only indication for a temporary tourniquet at ordinary temperature is uncontrollable hemorrhage. The limb should then be kept at the lowest temperature that is feasible without freezing.

3. If refrigeration is available, it is a safe aid for inhibiting some degrees of shock, and more or less superficial infections without a tourniquet.

4. A tourniquet may be used with refrigeration for controlling hemorrhage, or more severe shock, infection, or pain, or for anesthesia preparatory to operation. The safe time of application of the tourniquet to a wounded limb is for a period of at least three or four hours and probably much longer, according to the character of the wound.

5. For extreme emergencies of shock, or wounds which might require ligation-refrigeration for from ten to twenty-four hours or longer, the use of heparin may assure safety, because the animal experiments indicate that there is no danger except that of thrombosis.

6. If the shock or other emergency is serious enough to threaten life, the tourniquet and refrigeration can be used for a long time without heparin. There is a fair chance of absence of harm, but if thrombosis occurs, an amputation can be performed without other anesthesia, and life can be saved at the cost of the limb.

7. Local reduction of temperature can be very radical in degree, but its range of application is confined practically to the limbs or superficial areas.

8. Reduction of general body temperature has the advantage of being applicable to shock from any source, but physiologically it is very different because the safe degree of cooling is very slight in comparison with limb refrigeration.

The essential therapeutic effect of these measures

is a retardation of the shock process, which affords a greatly lengthened time for other treatment, and better ability to respond to it. Within limits, the lengthened survival can be converted into permanent recovery by the simple administration of fluids through the stomach, or of salt solution subcutaneously.

STEPHEN A. ZIEMAN, M.D.

Fell, E. H., and Hanselman, R.: The Prevention of Shock and Death by Immediate Application of a Pressure Dressing to the Severely Frozen Limbs of Dogs. *Ann. Surg.*, 1943, 117: 686.

The immediate, careful application of pressure dressings (plaster encasement) prevented shock and the death of 5 dogs of which the right hind extremity had been severely frozen. The blood volumes, as determined by the hematocrit, were maintained in this group in levels not producing shock.

JOHN J. MALONEY, M.D.

Howland, J. W., and Mahoney, E. B.: The Protein and Fluid Balance in Experimental Shock Produced by Intestinal Trauma. *Surgery*, 1943, 13: 889.

A fundamental factor in the development of hematogenic shock is the decrease in the effective circulating blood volume. There is considerable discussion as to whether a local loss of fluid at the site of injury can account for the depletion of the blood volume. In attempts to solve this problem, previous experiments have been concerned largely with fluid changes measured in terms of the increase in weight of the traumatized tissues. The nature and amount of the plasma protein lost from the circulation has received less attention. Hence, it is important that experiments be undertaken in which the plasma protein as well as the fluid loss be determined. The authors' experiments were performed in an effort to trace both the protein and fluid loss.

In experimental shock produced by standardized intestinal trauma, it is possible to collect quantitatively the protein and fluid lost at the site of injury. In this type of shock most of the fluid and protein which are lost from the circulation can be recovered at the site of trauma. This loss occurs both from the serosal surface of the bowel and as extravasation into the bowel wall and its mesentery.

The changes in the circulating protein during the development of shock are very definite. The concentration of circulating total protein, and, thus, the plasma specific gravity decrease.

The albumin-globulin ratio of the peritoneal fluid is always greater than that of the circulating plasma. This indicates a greater proportional loss of albumin than of globulin. More albumin is lost in the early phase of shock; more globulin in the terminal phase.

The major proportion of fluid and protein lost from the circulation can be recovered at the site of trauma when shock is not treated. This is not true when the shock is treated with plasma.

ERNEST E. ARNHEIM, M.D.

Elman, R., Lischer, C., and Brown, F. L., Jr.: Experimental Burns. I. Methods, Mortality, and Hemoconcentration Curves. II. Effect of Elastic Pressure Applied to a Burned Area. *War Surg.*, Chic., 1943, 3: 477, 482.

A standard burn stimulus in the dog can readily be achieved by the use of hot water at a constant temperature, with a uniform degree of exposure over a constant portion (75 per cent) of the body surface. With an exposure of five seconds at 80°C., a purely inflammatory reaction was produced without moist tissue necrosis, and possible complications, due to absorption of toxic products from the autolysis of such tissue, were thus avoided.

In a comparison of the results with those in human beings, it must be admitted that the anesthesia, which is necessary, introduces a complicating factor, inasmuch as the burns sustained by human beings occur without the benefit of such anesthesia. It is believed, however, that with the single injection of soluble pentobarbital and morphine, errors which are introduced by the anesthesia are relatively constant.

The uniform hemoconcentration curve in animals which survived the burn stimulus indicates that the exudation in response to the inflammatory process gradually reached its peak in about fourteen hours and then slowly receded during an approximately equal period, ending at about thirty or thirty-one hours. That this is a fundamental phenomenon in burns is indicated by its uniformity, regardless of the type of burn, and particularly by its independence of the type of therapy used; i.e., although transfusions of plasma lower the hemoconcentration when given during the first fourteen hours after burning, this effect occurs only during the injection and does not affect the ultimate behavior of the curve. From the therapeutic point of view, therefore, this emphasizes the importance of continuing transfusions of plasma through and past the peak of hemoconcentration clinically, although the total period is probably longer than the thirty hours in the present experiments.

It should be noted that weeping of the burned area in human beings is frequent, whereas it did not occur in the experimental dogs; this may account for the longer period of loss of fluid in human beings. Extensive infection, also, which leads to further loss of protein by exudation, may be an added factor in human beings in producing a prolonged hemoconcentration. In the experiments reported, infection did not play any part, because of their short duration and because the skin of the dog may have a relatively greater resistance to trauma which is produced by heat.

Experimental evidence is presented which indicates that in dogs the use of local elastic pressure lowers the degree of hemoconcentration, as shown by hematocrit readings, lessening thereby the loss of fluid beneath the burned surfaces. However, the mortality rate was not altered by such treatment.

SAMUEL KAHN, M.D.

HOSPITALS; MEDICAL EDUCATION AND HISTORY

Bonney, V.: The Forces Behind Specialism in Surgery. *Lancet, Lond.*, 1943, 244: 669.

Specialism in the widest sense is a state in which the main intellectual activity of an individual, or a group of individuals, is permanently concentrated on one object or one set of objects. However, opportunity limits the acquirement of knowledge long before the absolute potentiality of the brain is reached. There are certain kinds of knowledge for which the opportunity to acquire it is large and constant so that many persons can avail themselves of it. Conversely, there are other kinds for which this opportunity is so small and inconstant that few can ever partake of it, and, consequently, the number of persons well versed in these types must always be small.

At man's beginning, the demands on the mind were so few and simple and the opportunity for satisfying them so abundant that each individual was self-sufficing. As the intellect, passing beyond the immediately obvious, began to explore deeper and deeper into things, the limiting factor of opportunity came into play. As the ages rolled on, more and more occupations had to be segregated off, while each one grew in complexity, until at length certain of them became so multifarious that the opportunity afforded to a single mind was insufficient to fit it for all the demands the occupation made on it and these occupations had to be split up into departments. This has resulted in the profound specialism which we see all around us today.

Passing from the general to surgery in particular, man at his beginnings had to treat himself, whatever the nature of the ailment. The separation of surgery from medicine becomes distinct in England in 1308. At present the special departments of surgery are 12 in number: obstetrics, gynecology, ophthalmology, laryngology, urology, proctology, anesthesiology, orthopedic surgery, neurological surgery, thoracic surgery, reconstructive or plastic surgery, and dental surgery.

Excluding obstetrics, the modern surgical specialties were all created by certain general surgeons who concentrated their main efforts on one particular facet of their art. These men initiated the special hospitals and special departments which have made possible the pure specialist and which supply the beginner with the material needful for his training so that his way is made comparatively easy. Opportunity, special aptitude, and determination are the main factors in determining the field in which a man may specialize.

Surgeons, in general, have been brought (not very willingly) to recognize that better surgical work is produced if, say, A confines his chief activities to the abdomen, B to the thorax, C to the cerebrospinal system, and so on; provided always—and it is an essential proviso—that neither A, B, C, nor D, or the whole alphabet if you like, loses touch with surgery as a whole. Specialism has been scoffed at as a state of "knowing more and more about less and less," but the whole trend of modern science refutes the gibe, for it increasingly finds in the study of the minute the way to understanding of grosser things; and if, in perfecting the units of surgery, we can at the same time maintain them in cohesion, we shall perfect surgery as a whole.

However, in this question of cohesion lies the whole difficulty and danger. Too restricted attention to one subject cramps the outlook, narrows the mind, destroys the sense of proportion, deforms the specialty, and tends in the end to transform it into a cult. Whereas, before, the surgeon made the specialty, it is now possible for the specialty to make the surgeon. This product is the specialist *ab initio*, whose knowledge is derived solely from the specialty, so that, unless he possesses unusual powers of educating himself, he will remain a person of confined vision and narrow ability. The immediate effect on the specialty is bad, but its ultimate effect, though not so obvious, is worse, for his successors, who work under him and learn from him, are in grave danger of inheriting the same limitations. Overspecialization is not only harmful to the specialty, but is injurious to surgery as a whole, for the wider conception being lost, the specialty becomes self-centered and parochial, and sooner or later this attitude tends toward a movement for complete separation.

What can be done to guard against overspecialization and the ill results which spring from it? First, every aspirant to surgical specialization, before ever he begins to practice the specialty, should have undergone an adequate training in surgery in general, and (excepting dental surgeons and anesthetists) as evidence of such should have attained a fellowship of one of the royal colleges. The fellowship of this college is highly prized, and attempts have been made at different times to mitigate the rigor of the examinations on which its bestowal depends and to lighten the burden of the training which has to precede them. However, these examinations have for their object not only the testing of knowledge but the ascertainment of qualities equally necessary to a surgeon: industry, for his life should be one of unremitting work; self-abnegation, for he will have to forego many pleasures; determination, for the calling preeminently demands moral courage; quick-wittedness, because in surgery vital decisions have to be made instantly. Would anyone whose life one day may depend on a surgeon's qualities, have it otherwise?

It cannot be too strongly insisted that no one should practice in a special department of surgery unless he is competent to deal with every condition with which he may be confronted. The gynecological surgeon should be familiar with the surgery of the bladder, the rectum, and the abdominal contents generally, and should perform such operations as occasion demands, for otherwise he cannot remain competent in them.

Bonney has traced the course of specialism in surgery and has shown that it is only one expression of

the universal specialization which has been forced on man's intellectual activity by the shortness of life and the limitations imposed by opportunity. If its appearance and development were compelled solely by the pressure of circumstances there would be little to be proud about, but there is another aspect to be considered and that is the urge to perfection.

The urge to perfection has had this effect on surgery: it has impelled certain surgeons to elect to try to do a few things perfectly rather than to do a number of things well, and this spiritual dedication to the ideal of perfection is the crowning justification and the glory of surgical specialism.

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Medical Department, Pan American Airways-Africa Ltd.: Development of a Medical Service for Airline Operation in Africa. *War Med.*, Chic., 1943, 3: 484, 619.

When an airline is rapidly organized and put into operation in tropical areas, heavy demands are placed on its medical department. This unit must anticipate and plan for contingencies that do not arise in temperate climates. It must also be self sufficient, because replacements in men and materials are difficult to obtain, particularly in wartime. Since in the tropics, health, more than any other factor, determines whether an airline can function satisfactorily, the responsibilities of the medical department are of vital importance.

The care of personnel scattered over enormous distances where health conditions were particularly hazardous and medical attention difficult to obtain constituted the greatest problem encountered by the Pan American Airways-Africa, Ltd. The scheduled operations started at Bathurst, in Gambia, and went down the west coast of Africa as far as Lagos, Nigeria, a distance of 1,731 miles. From Lagos the line passed almost directly across the geographical center of Africa to Khartoum, at the junction of the Blue and the White Nile, and thence up to Cairo, in Egypt. The total distance was 4,892 miles. Later the operations were increased to include two routes through the Middle East to India, and in addition there were many unscheduled flights, although most of the medical responsibilities were limited to Africa. The route was over semijungle marshes; forests; high, dry plateaus; and arid deserts, the temperature and humidity conforming to the type of country traversed.

SELECTION OF PERSONNEL

The personnel to be selected included medical officers, dental officers, technical assistants, and nonmedical personnel. The medical officers selected for this route were purposely younger men who with one exception had no experience in "tropical medicine." All had had excellent basic training with three to five years of postgraduate study. It was considered that one medical and one surgical officer could care for a complement of 600 men. A dental officer is a necessity, as there is little opportunity for outside dental care. Qualified laboratory diagnosticians also are essential as they must be able to make complete parasitological examinations, studies of the blood, serological tests, and basic chemical determinations. A sanitarian, an entomologist, and male nurses were also employed, likewise nonmedical personnel. Each candidate for foreign service in the tropics was required to undergo a complete medical examination. Once accepted, the various personnel received the necessary inoculations against smallpox and yellow fever; three inoculations of typhoid-paratyphoid vaccine; three inoculations of tetanus toxoid; and two inoculations of cholera vaccine.

EFFECT OF THE TROPICS ON PERSONNEL

In spite of the fact that many conditions were trying, most of the men tolerated the tropics exceedingly well. The age limit was arbitrarily set at between eighteen and forty-five, although most of the employees were under thirty. Of the 1,300 men sent to Africa, only 37 were returned for medical reasons, and none of these was seriously incapacitated. Some of the reasons for medical discharge were as follows: peptic ulcer, 8; malaria (recurrent attacks) 5; strained back, 4; alcoholism, 2; psychoneurosis, 2; chronic otitis media, 2; pulmonary disease, 2; dermatitis 2, and miscellaneous conditions, 10.

HOSPITALS, DISPENSARIES, AND EQUIPMENT

During the period under discussion, one 50-bed hospital, two 12-bed hospitals, and three dispensaries were in operation. The type of construction is important, and the following features should be emphasized:

All units must be screened with 18-mesh wire. Quarters should be absolutely mosquito-proof and fly-proof, and complete in the sense that all structures housing men after dusk are enclosed. The number of entrances should be kept at an absolute minimum, even at the expense of some convenience. They should be provided with a mosquito trap vestibule constructed with two outward swinging screen doors spaced at least 6 ft. apart.

PREVENTIVE MEDICINE

The prevention of disease should be the major effort. In spite of the fact that the airline passed through a part of the world noted for its high incidence and wide variety of tropical diseases and known as the "white man's grave," only malaria and dysentery caused any real concern.

MALARIA

The principal insect vector encountered is the dreaded mosquito, anopheles gambiae, which breeds prolifically and is one of the most efficient of all carriers of malaria. There is also a large native population which is almost uniformly infected, which furnishes an enormous reservoir for the dissemination of the disease to all persons who enter the country. As might be expected, exposure of the personnel without proper protective measures against malaria-

carrying mosquitoes in unsanitated areas resulted in a major epidemic which occurred a few weeks after their arrival. The loss in man days from October 1 to December 26, 1941, was estimated at one thousand, eight hundred and ninety-four (1894) for 300 men. In spite of the fact that this major outbreak occurred in a bad area, the number of cases decreased rapidly after the mosquito proofing of quarters, drainage of breeding areas, and effective spraying of quarters with insecticides. The epidemic failed to reappear during the normally bad period a year later, and malaria was acquired locally in September, 1942, by only 1 of 1,400 men, and in October by only 3 of 1,820 men. The incidence was so low that malaria was only a potential problem.

Protection of each person against the bites of infected mosquitoes probably was the most effective and practical procedure for controlling malaria. This was accomplished by means of bed nets and screening of quarters. Spraying of European and native quarters with pyrethrum and kerosene likewise proved a most valuable protective measure. A trained crew of three native boys sprayed the quarters every day except in some of the most heavily infested areas where the stations were sprayed twice daily. Adjacent native quarters, which should always be at least one-half mile or more from the camp, were sprayed twice weekly. The effectiveness of this method of control was evident from the fact that the number of mosquitoes could be reduced practically to a vanishing point even in the unscreened native compounds.

Larvicidal measures consisted in spraying the favored breeding spots of the vector with kerosene and crankcase oil, or a commercial preparation, or the areas were dusted with 1 per cent Paris green in fine sand. All measures for controlling larvae were applied once a week and were under the direction of a medical entomologist.

A considerable amount of money was expended on adequate drainage about the airports and a small maintenance group was made constantly available to correct washouts and prevent small potholes from forming in the bottom of the ditches.

PROPHYLAXIS

Neither quinine nor atabrine will suppress all infections, but suppressive prophylactic therapy should be employed in all areas where the malaria rate is excessive, where falciparum malaria is predominant, or where measures of control are difficult to enforce. Otherwise, it is not recommended. The report that the use of atabrine limited the height to which aviators may ascend seems not to be well founded. In our experience, the prophylactic dose was insufficient to produce any deleterious effect on aviators; besides, if men are ill and under therapeutic dosage, they should not be permitted to fly.

TREATMENT

All malarial infections except three were of the falciparum (malignant tertian) variety. All men suspected of having malaria were hospitalized immediately, but treatment was withheld until malarial parasites were found in thick blood smears. Treatment was varied. The majority of patients were treated with quinine sulfate, 2.0 gm. daily for seven days, followed by 0.3 gm. of atabrine dihydrochloride daily for five days. Others were treated for seven days with quinine or atabrine alone. In the treated series, irrespective of the method of treatment, the average duration of fever after the institution of therapy was slightly less than four days. It was rarely necessary to attempt parenteral administration of quinine or atabrine. With any form of treatment the criterion for discharge was four fever-free days with blood smears negative for malarial parasites.

INFECTIOUS GASTROINTESTINAL-TRACT DISEASES

Next to malaria the infectious gastrointestinal-tract diseases (diarrheas and dysenteries) were the chief cause of temporary disability and loss of time from work. Diarrheas were the most frequent hospital admissions. At a large base in the Sudan, it was estimated (before adequate sanitary measures were taken) that about 20 per cent of the personnel contracted diarrhea one or more times per month. There have been no known cases of typhoid or paratyphoid fever. Most of the diarrheas were probably food-borne and fly-borne, since water at all stations, except one, was either chlorinated and filtered or boiled. The results of examinations of the stools of native food handlers for ameba histolytica led us to suspect that most of our cases of amebiasis probably came from this source. It was estimated on the basis of 600 stool examinations that over 28 per cent of the native population around the main base was infected with ameba histolytica.

TREATMENT

Treatment was mostly supportive. The use of chemotherapy (sulfaguanidine) was reserved for patients with fever, toxic symptoms, and blood and pus in the stools. A few patients who apparently had bacillary dysentery (unproved bacteriologically) responded well to therapy with succinylsulfathiazole. In the treatment of amebiasis a fairly uniform procedure was used. Therapy with emetine hydrochloride, (0.060 gm. daily, administered subcutaneously or intramuscularly) was instituted and continued until after diarrhea and cramps had subsided, which was usually promptly, within twenty-four to seventy-two hours. Exclusion of flies from messes and latrine by screening was the single most important factor in the prevention of dysentery.

The preparation and preservation of food in the tropics are important, because the heat and the humidity offer ideal conditions for the growth of pathogenic bacteria in pastries, dairy products, and meat.

GENERAL MEDICAL PROBLEMS

The general medical problems of American personnel in the African tropics were not unlike those

encountered in the United States. The incidence of disease was low. The general health remained good throughout the year, and there was no evidence to indicate that the climate per se had any deleterious effect on health. The good health of the group can undoubtedly be ascribed to the good living conditions provided, an adequate diet, and the public health measures taken.

Infections of the upper respiratory tract were common and formed the bulk of complaints of the men coming to the clinics.

Although not incapacitating, with the exception of a few instances, fungous infections of the skin were frequent.

The diagnosis of peptic ulcer was made for 8 persons, with associated hematemesis in one case and perforation in another. Histories indicated that some of these patients had had their ulcers prior to coming to the tropics, whereas in others the ulcers developed after arrival in Africa.

The number of cases of venereal disease was relatively small, only 1.2 per cent for the fourteen months.

Fever of undetermined causation was fairly common, occurring in about one-tenth as many patients as malaria. Clinically, this fever could have been given the diagnosis of malaria, but without treatment other than symptomatic care the patients usually became afebrile within three to seven days.

In résumé, it may be said that preventive medicine and public health measures, if properly instituted, can eliminate the majority of the diseases usually affecting a group moving into the tropics. Once the public health program is carried out, the medical problems in the tropics become quite similar to those in the temperate zone for persons of a similar age group, with the exception that there is a slightly wider range of diagnostic possibilities in the tropics.

PSYCHIATRIC PROBLEMS

Psychiatric problems were minimal. The personnel, before going overseas, were all carefully selected, although no special psychiatric examination was made. All were volunteers and looked forward to living in Africa as an adventure or an opportunity. There was little ground for dissatisfaction with the physical setup, and recreational facilities were adequate. Service periods were for one year, at the end of which time vacations of one month were given at home. On the whole, there was an excellent *esprit de corps*.

SURGICAL PROBLEMS

The surgical problems encountered among white personnel in no way differed from those met with in temperate zones. This, of course, is not true of the native population, among whom elephantiasis of the lower extremities and scrotum, guinea-worm infection, tropical ulcers, and hydroceles were commonly encountered, in addition to the more familiar diseases requiring surgical treatment.

There were 10 major surgical operations in the one-year period. These included 4 appendectomies, 1 with drainage; 1 herniorrhaphy; 1 ureterolithotomy; 1 cholecystectomy; 1 closure of a perforated duodenal ulcer; 1 drainage of a badly septic hand; and 1 closure of a stomach perforated by a .45 caliber bullet which traversed the chest and peritoneal cavity.

Spinal anesthesia and inhalation anesthesia, induced with pentothal sodium or ether, proved satisfactory.

Hospital admission rates at the highest level were 1 per cent.

DEATHS

There were 9 deaths among the personnel during the period covered in this report. Five pilots died in aircraft accidents. Two maintenance men died from accidental burns. There was 1 death due to disease and a construction man died from peritonitis following intestinal obstruction.

A variety of health rules is appended which were found helpful and necessary for daily life in the tropics.

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